OCTOBER 1929 25 Cents a Year

Contractors and Engineers Monthly

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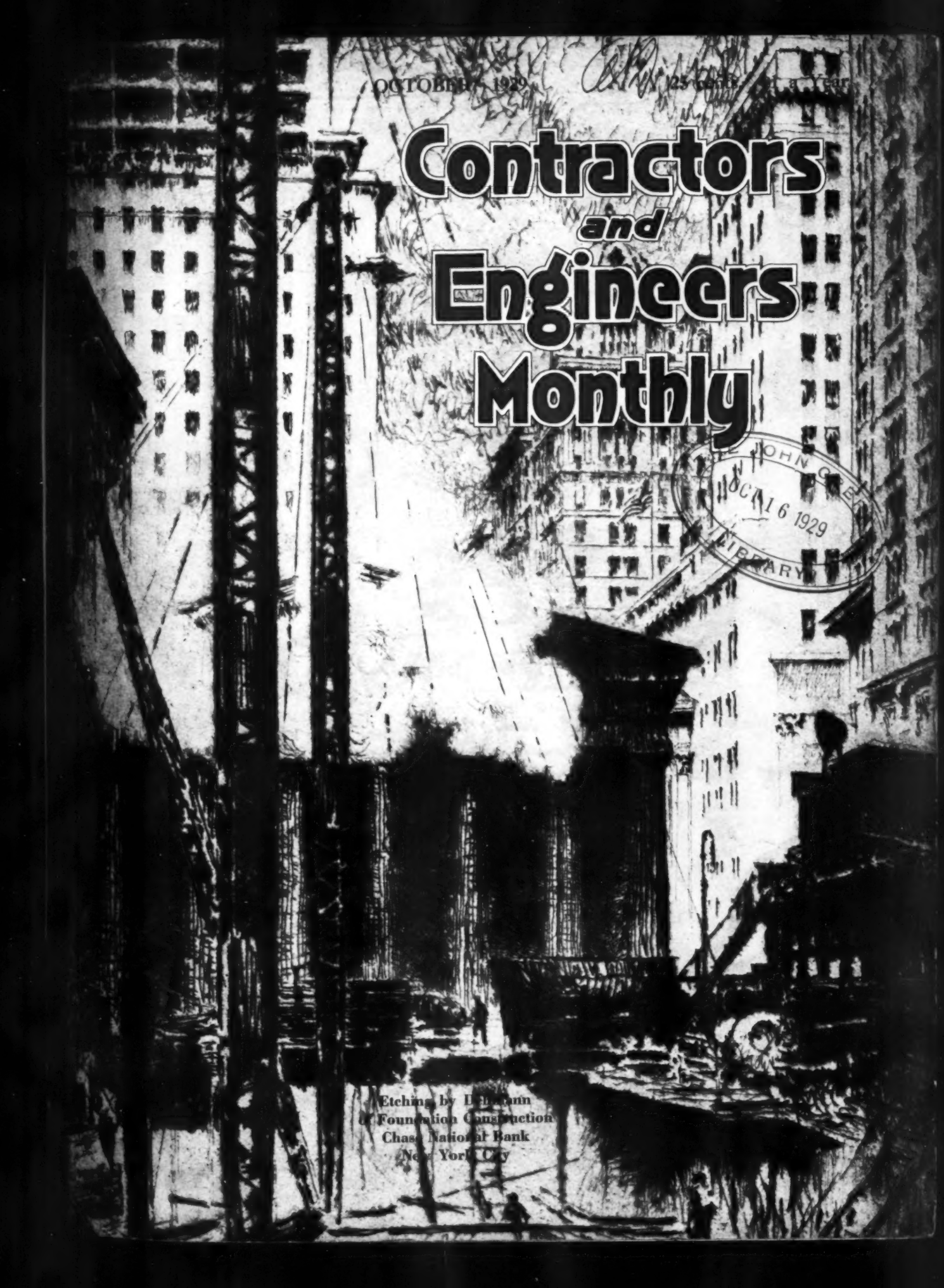

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Where to Purchase

A comprehensive classification of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may wish to secure information about construction equipment.
The Index of Advertisers faces the inside back cover. When writing to advertisers please mention the CONTRACTORS & ENGINEERS MONTHLY. A star (*) before the manufacturer's name indicates that his advertisement appears in this issue.

This index is published as an aid to the reader, but the publishers assume no responsibility for errors or omissions.

AIR COMPRESSORS

*Allis-Chalmers Mfg. Co., Milwaukee
*Buhl Company, Chicago
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Independent Pn. Tool Co., Chicago, Ill.
*Nove Engine Co., Lansing, Mich.
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Sullivan Machinery Co., Chicago
Acme Road Machy. Co., Frankfort, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Barnes Mfg. Co., Mansfield, O.
Cement-Gun Co., Allentown, Pa.
Chicago Pneumatic Tool Co., N. Y.
Cook Motor Co., Delaware, O.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
De Laval Steam Turbine Co., Trenton, N. J.
Fairbanks, Morse & Co., Chicago.
Gardner-Denver Co., Quincy, Ill.
General Electric Co., Schenectady, N. Y.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Indiana Air Pump Co., Indianapolis, Ind.
Ingersoll-Rand Co., N. Y.
Nordberg Mfg. Co., Milwaukee, Wis.
Norwalk Iron Works Co., So. Norwalk, Conn.
Schramm, Inc., West Chester, Pa.
United Iron Works, Kansas City, Mo.
Westinghouse Traction Brake Co., Wilmerding, Pa.
Worthington Pump & Machinery Corp., N. Y.

AIR COMPRESSORS, PORTABLE

*Buhl Co., Chicago
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Independent Pneu. Tool Co., Chicago
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Sullivan Machinery Co., Chicago
Cement-Gun Co., Allentown, Pa.
Chain Belt Co., Milwaukee, Wis.
Chicago Pneumatic Tool Co., New York
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Ingersoll-Rand Co., New York
Metalweld, Inc., Philadelphia, Pa.
National Brake & Electric Co., Milwaukee
Schramm, Inc., West Chester, Pa.
Simons Paint Spray Brush Co., Dayton, O.

ARTESIAN WELL DRILLS & PUMPS

American Well Works, Aurora, Ill.
Ingersoll-Rand Co., New York
Star Drilling Machine Co., Akron, O.

ASPHALT

*Barber Asphalt Co., Philadelphia
*Barrett Co., N. Y.
*Standard Oil Co. (Ind.), Chicago
*Standard Oil Co. (N. Y.), N. Y.
Atlantic Ref. & Asph. Corp., Philadelphia
Gulf Refining Co., Pittsburg
Ky. Rock Asph. Co., Louisville, Ky.
Natural Rk. Asph. Corp., Owensboro, Ky.
New Orleans Ref. Co., New Orleans
Pioneer Asph. Co., Lawrenceville, Ill.
Sinclair Ref. Co., Chicago
Standard Oil Co. of Cal., S. Francisco
Standard Oil Co. of La., N. Orleans
Standard Oil Co. of N. J., Newark
Texas Co., N. Y.
Utah Rock Asphalt Corp., Pueblo, Colo.
Warren Bros. Co., Boston

ASPHALT BLOCK

Hastings Pavement Co., N. Y.

ASPHALT BRICK

Asphalt Brick Co., St. Louis

ASPHALT CUTTERS

*Independent Pneumatic Tool Co., Chicago
*Sullivan Machinery Co., Chicago
Chicago Pneumatic Tool Co., N. Y.
Cleveland Rock Drill Co., Cleveland, O.
Dayton Pneum. Tool Co., Dayton, O.
Gardner-Denver Co., Quincy, Ill.
Ingersoll-Rand Co., N. Y.
Littleford Bros., Cincinnati.

ASPHALT KETTLES (See Kettles for Asphalt and Tar Heating)

ASPHALT PLANTS, TOOLS, ETC.

*American Fork & Hoe Co., Cleveland, O.
*Barber Asphalt Co., Philadelphia
*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Company, Philadelphia
Aeroil Burner Co., West New York, N. J.
American Fin-Mix Co., Chicago.
Charleroi Iron Wks., Charleroi, Pa.
F. D. Cummer & Son Co., Cleveland, O.
J. D. Farasey Mfg. Co., Cleveland, O.
Hetherington & Berner, Indianapolis
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros., Cincinnati
Merriman Asphalt Plant, Inc., Lima, O.
Warren Bros. Co., Boston

ASPHALT POURING POTS (See Pots, Asphalt Pouring)

ASPHALT ROLLERS (See Road Rollers)

ASPHALT SURFACE HEATERS

*Barber Asphalt Co., Philadelphia
*Chausse Oil Burner Co., Elkhart, Ind.
Aeroil Burner Co., West New York, N. J.
Equitable Asp. Maint. Co., Kan. City, Mo.
Hauck Mfg. Co., Brooklyn, N. Y.

BACKFILLERS

*Baker Mfg. Co., Springfield, Ill.
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*General Wheelbarrow Co., Cleveland
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*Parsons Co., Newton, Ia.
Austin Mach. Corp., Muskegon, Mich.
Buckeye Trac. Ditcher Co., Findlay, O.
Byers Mach. Co., Ravenna, O.
Construction Machy. Co., Waterloo, Ia.
Ersted Mfg. Co., Portland, Ore.
General Excavator Co., Marion, O.
Harnischfeger Corp., Milwaukee, Wis.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Link-Belt Co., Chicago
Miami Trailer-Scraper Co., Troy, O.
Orton Crane & Shovel Co., Chicago
Star Drilling Mach. Co., Akron, O.
Speeder Machy. Corp., Cedar Rapids, Iowa
Waterman Corp., Detroit
Weller Mfg Co., Chicago

BAGS

Bates Valve Bag Corp., Chicago

BAG TRUCKS

Bates Valve Bag Corp., Chicago
Case Crane & Engg. Co., Columbus, O.

BAR BENDERS AND CUTTERS

*Koehring Co., Milwaukee, Wis.
*Ransome Conc. Machy. Co., Dunellen, N. J.
Buffalo Forge Co., Buffalo, N. Y.
Concrete Steel Co., N. Y.
Electric Welding Co., Pittsburgh
D. A. Hinman & Co., Sandwich, Ill.
J. L. Gleason & Co., Boston, Mass.
Kardong Bros., Minneapolis
McKenna Co., Cleveland, O.

BARRICADE SUPPORTS

*Cleveland Steel Spec. Corp., Cleveland, O.

BAR TIES

Bates Valve Bag Corp., Chicago
Symons Clamp & Mfg. Co., Chicago, Ill.

BATCH BOXES

*Blaw-Knox Co., Pittsburgh, Pa.
*Butler Bin Co., Waukesha, Wis.
*Erie Steel Const. Co., Erie, Pa.
*Fairfield Engineering Co., Marion, Ohio
*Heltzel Stl. Form & Ir. Co., Warren, O.
*Jos. Honhorst Co., Cincinnati
*Lakewood Eng. Co., Cleveland, O.
Easton Car & Const. Co., Easton, Pa.
Easton Car & Const. Co. of Mo., Kansas C., Mo.
Koppel Ind. Car & Equip. Co., Koppel, Pa
Littleford Bros., Cincinnati
Jas. B. Seaverns Co., Batavia, Ill.
Western Wheeled Scraper Co., Aurora, Ill.

BATCHERS (For Measuring Aggregates)

*Blaw-Knox Co., Pittsburgh, Pa.
*Butler Bin Co., Waukesha, Wis.
*Erie Steel Construction Co., Erie, Pa.
*Fairfield Engineering Co., Marion, Ohio
*Heltzel Stl. Form & Ir. Co., Warren, O.
Superior Engineering Co., Warren, Ohio.

BEARINGS

Fafnir Bearing Co., New Britain, Conn.
Hyatt Roller Bear. Co., Harrison, N. J.
New Departure Mfg. Co., Bristol, Conn.
S. K. F. Industries, New York
Timken Roller Bearing Co., Canton, O.

BINS, STORAGE

*Austin-Western Rd. Mach. Co., Chicago
*Beaumont Mfg. Co., Philadelphia
*Blaw-Knox Co., Pittsburgh, Pa.
*The Burch Corp., Crestline, Ohio
*Butler Bin Co., Waukesha, Wis.
*Erie Steel Const. Co., Erie, Pa.
*Fairfield Engineering Co., Marion, Ohio
*Good Roads Mchy. Co., Kennett Sq., Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Industrial Brownhoist Corp., Cleveland, O.
*Ransome Conc. Machy. Co., Dunellen, N. J.
Austin Mfg. Co., Chicago
Birmingham Tank Co., Birmingham, Ala.
Canton Art Metal Co., Canton, Ohio
Easton Car & Const'n. Co., Easton, Pa.
Galion Iron Works & Mfg. Co., Galion, Ohio
C. S. Johnson Co., Champaign, Ill.
Lancaster Iron Works, Inc., Lancaster, Pa
Link-Belt Co., Chicago
Pittsburgh-Des Moines Stl. Co., Pittsburgh, Pa
Jas. B. Seaverns Co., Batavia, Ill.
Superior Engineering Co., Warren, Ohio
Universal Rd. Mach. Co., Kingston, N. Y.
Weller Mfg. Co., Chicago.

BLADES FOR GRADERS & SNOW PLOWS

*Caterpillar Tractor Co., San Leandro, Cal.
*General Wheelbarrow Co., Cleveland
J. D. Adams & Co., Indianapolis
Galion Iron Works & Mfg. Co., Galion, Ohio
Shunk Mfg. Co., Bucyrus, Ohio

BLAST HOLE DRILLING MACHINES (See Well Drilling and Blast Hole Machines)

BLASTING POWDER (See Explosives)

BLOCKS AND TACKLE

*Boston & Lockport Blk. Co., Boston, Mass.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N.Y.
Western Block Co., Lockport, N. Y.

BLOW TORCHES

*Chausse Oil Burner Co., Elkhart, Ind.
*G. H. Williams Co., Erie, Pa.
Everhot Mfg. Co., Maywood, Ill.

BLUE PRINT MACHINES

Paragon Mach. Co., Rochester, N. Y.
C. F. Pease Co., Chicago
Wickes Bros., Saginaw, Mich.

BOILERS

*Johnston Bros., Inc., Perrysburg, Mich.
Chandler & Taylor Co., Indianapolis
Chatta. Boiler & Tank Co., Chatta., Tenn.
R. D. Cole Mfg. Co., Newnan, Ga.
Combustian Eng. Corp., N. Y.
Erie City Iron Works, Erie, Pa.
Hartley Bir. Works, Montgomery, Ala.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Heine Boiler Co., St. Louis, Mo.
E. Keeler Co., Williamsport, Pa.

For Directory of Local Distributors of Contractors' Equipment, See Pages 131 to 156

Where to Purchase

BOILERS, (Continued)
Ladd Water Tube Bir. Co., Pittsburgh, Pa.
V. Loffel & Co., Springfield, Ohio
Lord & Burnham Co., Irvington, N. Y.
Murray Iron Works Co., Burlington, Iowa
Nagle Eng. & Bir. Works, Erie, Pa.
New Bern Iron Works & Sup. Co., New Bern, N. C.
Petroleum Iron Works Co., Sharon, Pa.
J. S. Schofield's Sons Co., Macon, Ga.
Stanwood Corp., Cincinnati, Ohio
Superior Body Corp., Marion, Ind.
Vogt. Mchy. Co., Inc., Louisville, Ky.

BRACES, TRENCH
*Templeton, Kenly & Co., Chicago
Jas. H. Channon Mfg. Co., Chicago
Duff Mfg. Co., Pittsburgh, Pa.
Fisher & Hayes Rope & Steel Co., Chicago
Hawley Mfg. Co., Chicago
Kalamazoo Fdry. & Mach. Co., Kalamazoo, Mich.
Waldo Bros. & Bond Co., Boston

BRANDING TOOLS
Everhot Mfg. Co., Maywood, Ill.

BRASS GOODS
Glauber Brass. Mfg. Co., Cleveland, Ohio
Haydenville Co., Haydenville, Mass.
Hays Mfg. Co., Erie, Pa.
Mueller Company, Decatur, Ill.
Union Water Meter Co., Worcester, Mass.
United-Obendorf Corp., Cleveland, Ohio

BREAKERS, CONCRETE
*Independent Pn. Tool Co., Chicago
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., N. Y.
Cleveland Rock Drill Co., Cleveland, Ohio
Gardner-Denver Co., Quincy, Ill.
Hardsoog Wonder Drill Co., Ottumwa, Iowa
Ingersoll-Rand Co., New York
Milwaukee Gas Tool Co., Milwaukee
Rapid Concrete Breaker Co., Los Angeles, Cal.

BRICK, PAVING (See Paving Brick)

BRIDGE FLOORS
*Armco Culvert Mfrs. Assn., Middletown, O.

BRIDGES AND BUILDINGS, STEEL
*Blaw-Knox Co., Pittsburgh, Pa.
*Frederick Snare Corporation, N. Y.
American Bridge Co., N. Y.
Bellefontaine Br. & Stl. Co., Bellefontaine, O.
Belmont Iron Works, Philadelphia
Berlin Constr. Co., Berlin, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Boston Bridge Works, Boston
Butler Mfg. Co., Minneapolis, Minn.
Central States Br. Co., Indianapolis, Ind.
Champion Bridge Co., Wilmington, Ohio
Chesapeake Iron Works, Baltimore, Md.
Clinton Bridge Works, Clinton, Iowa
Eastern Bridge & Struc. Co., Worcester, Mass.
Flour City Orn. Iron Co., Minneapolis
Fort Pitt Br. Works, Pittsburgh, Pa.
Hughes-Keenan Co., Mansfield, Ohio
Ingalls Iron Works Co., Birmingham, Ala.
Inter. Steel & Iron Co., Evansville, Ind.
Lakeside Br. & St. Co., No. Milwaukee.
Louisville Br. & Iron Co., Louisville, Ky.
McClintic Marshall Co., Pittsburgh, Pa.
Milwaukee Br. Co., Milwaukee, Wis.
Minn. Stl. & Mchy. Co., Minneapolis
Missouri Vy. Br. & Ir. Co., Leavenworth, Kan.
Mt. Vernon Br. Co., Mt. Vernon, Ohio
Penn Bridge Co., Beaver Falls, Pa.
Pittsburgh-Des Moines Stl. Co., Pittsburgh, Pa.
Richmond Struc. Stl. Co., Richmond, Va.
Riverside Br. Co., Martins Ferry, Ohio.
Virginia Br. & Ir. Co., Roanoke, Va.
Wisc. Br. & Ir. Co., No. Milwaukee, Wis.

BROOMS (See Street Sweeping Brooms)

BUCKETS, AUTOMATIC DUMPING
*Lakewood Eng. Co., Cleveland, O.
*Union Iron Wks., Inc., Hoboken, N. J.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.

BUCKETS, CLAM SHELL
*Blaw-Knox Co., Pittsburgh, Pa.
*Erie Steel Const. Co., Erie, Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Hayward Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
*Lakewood Eng. Co., Cleveland, Ohio
*G. H. Williams Co., Erie, Pa.
Buffalo Hst. & Der. Co., Buffalo, N. Y.
Browning Crane Co., Cleveland, Ohio
F. A. Coleman Co., Cleveland, Ohio
J. F. Kiesler Co., Chicago
Link-Belt Co., Chicago
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago
Owen Bucket Co., Cleveland, Ohio
Page Eng. Co., Chicago

BUCKETS, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.
*Union Iron Works, Inc., Hoboken, N. J.
Norris K. Davis, San Francisco, Calif.
Koppel Ind. Car & Equip. Co., Koppel, Pa.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.

BUCKETS, DRAGLINE
*Beaumont Mfg. Co., Philadelphia
*Blaw-Knox Co., Pittsburgh, Pa.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Hayward Co., New York
*Sauerman Bros., Chicago
Schofield-Burkett Constr. Co., Macon, Ga.
*G. H. Williams Co., Erie, Pa.
Link-Belt Co., Chicago
Monighan Mach. Co., Chicago
Page Eng. Co., Chicago
Pioneer Bucket Co., Indianapolis, Ind.

BUCKETS, DREDGING AND EXCAVATING
*Blaw-Knox Co., Pittsburgh, Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Hayward Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
*Lakewood Eng. Co., Cleveland, Ohio
*G. H. Williams Co., Erie, Pa.
Browning Crane Co., Cleveland
J. F. Kiesler Co., Chicago
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago
Owen Bucket Co., Cleveland, Ohio

BUCKETS, ORANGE PEEL
*Hayward Co., N. Y.
Industrial Works, Bay City, Mich.
J. F. Kiesler Co., Chicago
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago

BUILDING FORMS (See Forms, Conc.)

BUILDINGS, STEEL (See Bridges)

BULLDOZERS
*Trackson Co., Milwaukee, Wis.
Miami Trailer-Scraper Co.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa

BUNKS AND COTS
Ft. Pitt Bedding Co., Pittsburgh, Pa.
Haggard & Marcusson Co., Chicago
Southern Rome Co., Baltimore, Md.

CABLES (See Wire and Cable)

CABLEWAYS, DRAGLINE
*Beaumont Mfg. Co., Philadelphia
*S. Flory Mfg. Co., Bangor, Pa.
*L. P. Green, Chicago
*Sauerman Bros., Chicago
Schofield-Burkett Constr. Co., Macon, Ga.
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
Street Bros. Mach. Works, Chattanooga

CARS FOR MOTOR TRUCKS
Highland Body Mfg. Co., Cincinnati, Ohio
Weatherproof Body Corp., Corunna, Mich.

CAISSONS
American Bridge Co., N. Y.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Foundation Co., N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
O'Rourke Eng. Constr. Co., N. Y.
Petroleum Ir. Wks. Co., Sharon, Pa

CALCIUM CHLORIDE FOR ROADS
*Dow Chemical Co., Midland, Mich.
*Pittsburgh Plate Glass Co., Barberton, O.
*Solvay Sales Corp., New York

CANS FOR GARBAGE AND REFUSE
American Can Co., N. Y.
Economy Baler Co., Ann Arbor, Mich.
Rochester Can Co., Rochester, N. Y.
Solar-Sturges Mfg. Co., Melrose Pk., Ill.
Witt Cornice Co., Cincinnati, Ohio

CAR UNLOADERS (See Loaders)

CARS, INDUSTRIAL V. DUMPING
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
Atlas Car & Mfg. Co., Cleveland, Ohio
Austin Mfg. Co., Chicago
Case Crane & Engg. Co., Columbus, O.
Chase Fdry. & Mfg. Co., Columbus, Ohio
Easton Car & Const. Co., Easton, Pa.
C. W. Hunt Co., W. New Brighton, N. Y.
Koppel Ind. Car. & Equip. Co., Koppel, Pa.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.
United Ir. Wks., Inc., Kansas City, Mo.
Weller Mfg. Co., Chicago
Whiting Corp., Harvey, Ill.

CARTS, CONCRETE
*General Wheelbarrow Co., Cleveland, Ohio
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*Ransome Conc. Mchy. Co., Dunellen, N. J.
Acme Rd. Machy. Co., Frankfort, N. Y.
Case Crane & Engg. Co., Columbus, O.
Chattanooga Wheelbarrow Co., Chatta., Tenn.
Cleveland Wheelbarrow Co., Cleveland, Ohio
Easton Car & Const. Co., Easton, Pa.
E. D. Etnyre & Co., Oregon, Ill.
Gray Iron Fdry. Co., Reading, Pa.
Jackson Mfg. Co., Harrisburg, Pa.
Lee Trailer & Body Co., Plymouth, Ind.
Sterling Wheelbarrow Co., Milwaukee
Toledo Wheelbarrow Co., Toledo, Ohio

CAST IRON PIPE (See Pipe, Cast Iron)

CASTINGS, STEEL
*Brown Clutch Co., Sandusky, Ohio
*Cleveland Steel Tool Co., Cleveland
*G. H. Williams Co., Erie, Pa.
Farrell-Cheek Steel Fdy. Co., Sandusky, Ohio
Wheeling Mold & Fdry. Co., Wheeling, W. Va.

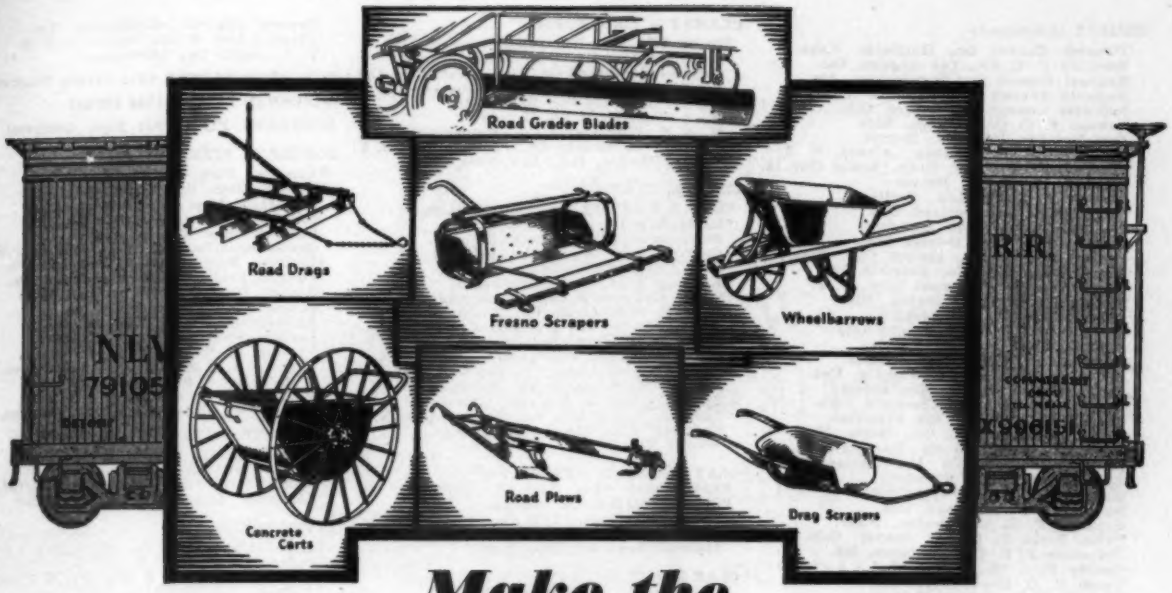
CASTINGS, STREET AND SEWER
*Armco Culvert Mfrs. Assn., Middletown, Ohio
*Central Fdry. Co., N. Y.
*U. S. Pipe & Fdry. Co., Burlington, N. J.
Canton Fdry. & Mach. Co., Canton, Ohio
H. W. Clark Co., Mattoon, Ill.
J. B. Clow & Sons, Chicago
W. E. Dee Co., Chicago
Donley Bros. Co., Cleveland
Elkhart Fdry. & Mach. Co., Elkhart, Ind.
Gallon Iron Works & Mfg. Co., Gallon, O.
Gilbert Mfg. Co., Aberdeen, S. Dak.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Klauer Mfg. Co., Dubuque, Iowa
Madison Fdry. Co., Cleveland, Ohio
Pechstein Iron Works, Keokuk, Iowa
Sessions Foundry Co., Bristol, Conn.
South Bend Fdry. Co., So. Bend, Ind.

CATCH BASINS (See Castings, Street)

CATCH BASIN CLEANING OUTFITS
Atia Sales Corp., New York
Elgin Sales Corp., N. Y.
Mack Trucks, Inc., N. Y.

CAULKING MACHINERY AND TOOLS
*Independent Pn. Tool Co., Chicago
Cleveland Rock Drill Co., Cleveland, Ohio
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., New York
Mueller Company, Decatur, Ill.

CEMENT—(P. C. stands for Portland Cement)
*Columbia Products Co., Barberton, Ohio
Acme Cement Corp., Catskill, N. Y.
Ætna P. C. Co., Detroit, Mich.
Allentown P. C. Co., Catasauqua, Pa.
Alpha P. C. Co., Easton, Pa.
Ash Grove Lime & P C. Co., Kansas City, Mo.
Atlas P. C. Co., N. Y.
Beaver P. C. Co., Portland, Ore.
Bessemer Limestone & C. Co., Youngstown, O.
British Col. Cement Co., Victoria, B. C.
Canada Cement Co., Ltd., Montreal, Canada
Colorado P. C. Co., Denver, Colo.
Consolidated Cement Corp., Chicago
Cowell P. C. Co., Cowell, Cal.
Crescent P. C. Co., Wampum, Pa.
Dewey P. C. Co., Kansas City, Mo.
Diamond P. C. Co., Cleveland, Ohio
Edison P. C. Co., N. Y.
Georgia Cement & Stone Co., Birmingham, Ala.
Giant P. C. Co., Philadelphia, Pa.
Glens Falls P. C. Co., Glens Falls, N. Y.
Golden State P. C. Co., Los Angeles, Cal.
Great West'n P. C. Co., Kansas City, Mo.
Hawkeye P. C. Co., Des Moines, Iowa
Hercules Cement Corp., Philadelphia
Hermitage P. C. Co., Nashville, Tenn.
Huron P. C. Co., Detroit, Mich.
International Cement Corp., N. Y.
International P. C. Co., Ltd., Spokane, Wash.
Kosmos P. C. Co., Louisville, Ky.
La Tolteca Compania de Cemento Portland, Mexico City, Mex.
Lawrence Cement Co., New York
Lehigh P. C. Co., Allentown, Pa.
Louisville Cement Co., Louisville, Ky.
Manitowoc P. C. Co., Manitowoc, Wis.
Marlboro Cement Co., Edmonton, Can.
Marquette Cement Mfg. Co., Chicago
Missouri P. C. Co., St. Louis, Mo.



Make the RAILROAD *your Partner in Profits*

THE General line affords the distributor, and therefore the contractor, important economies in ordering equipment. The items above are a few out of very many which can be combined to advantage by General distributors in mixed carloads.

Ordering this way, you obtain the savings of carload freight rates. Carload shipments come through faster. You keep your stock filled in and up to date. You give better service to your customers. You avoid tying up your capital in large inventories. And you know you can sell as low as anyone, because these carload economies and General's attractive prices enable you to compete with anyone in your territory.

Let us send you our New General Wheelbarrow Handbook No. 108 and our Highway Equipment Bulletin.

Empire Road Grader Blades have been furnished for over 40 years to leading road grader manufacturers. They are now being marketed direct through distributors by General Wheelbarrow Company. They are made of a new, exclusive alloy steel, and have an exact degree of curvature for better grading. Ask for Catalog No. 29.

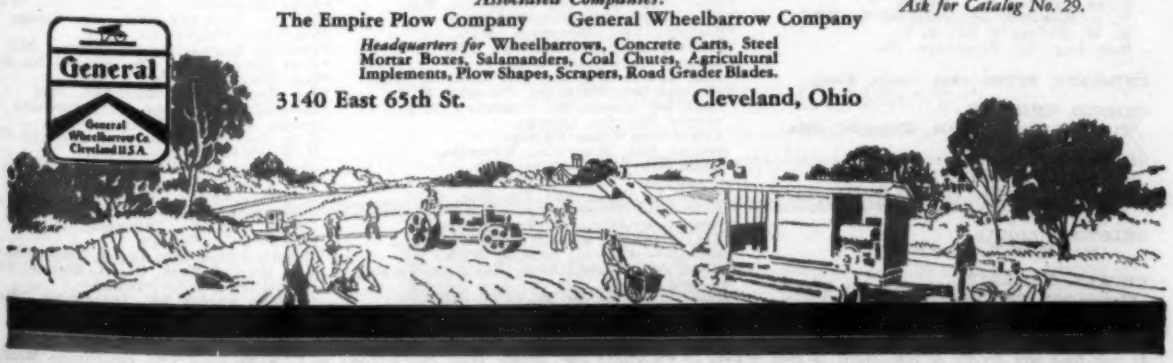
GENERAL WHEELBARROW COMPANY

Associated Companies:

The Empire Plow Company **General Wheelbarrow Company**

Headquarters for Wheelbarrows, Concrete Carts, Steel Mortar Boxes, Salamanders, Coal Chutes, Agricultural Implements, Plow Shapes, Scrapers, Road Grader Blades.

3140 East 65th St. **Cleveland, Ohio**



Where to Purchase

CEMENT (Continued)
Monarch Cement Co., Humboldt, Kans.
Monolith P. C. Co., Los Angeles, Cal.
National Cement Co., Birmingham, Ala.
Nazareth Cement Co., Nazareth, Pa.
Nebraska Cement Co., Denver, Colo.
Newago P. C. Co., Newago, Mich.
New Egyptian P. C. Co., Detroit
North Amer. Cement Corp., Albany, N. Y.
Northwestern States P. C. Co., Mason City, Ia.
Oklahoma P. C. Co., Denver
Olympic P. C. Co., Ltd., Seattle
Oregon P. C. Co., Portland, Ore.
Pacific P. C. Co., San Francisco
Peerless P. C. Co., Detroit, Mich
Peninsular P. C. Co., Cement City, Mich.
Penn-Allen Cement Co., Nazareth, Pa.
Pennsylvania-Dixie Cement Corp., N. Y.
Petoskey P. C. Co., Petoskey, Mich.
Phoenix P. C. Co., Philadelphia
P. C. Co. of Utah, Salt Lake City
Pyramid P. C. Co., Des Moines
Riverside P. C. Co., Los Angeles
St. Marys Cement Co., Toronto, Can.
San Antonio P. C. Co., San Antonio
Sandusky Cement Co., Cleveland, Ohio
Santa Cruz P. C. Co., San Francisco
Signal Mountain P. C. Co., Chatta., Tenn.
Southern States P. C. Co., Rockport, Ga.
Southwest'n. P. C. Co., Los Angeles, Cal.
Standard P. C. Co., Cleveland
Standard P. C. Co., Cleveland
Sun P. C. Co., Portland, Ore.
Superior P. C. Co., Seattle, Wash.
Three Forks P. C. Co., Denver, Colo.
Tidewater P. C. Co., Baltimore, Md.
Trinity P. C. Co., Dallas, Tex.
Union P. C. Co., Denver, Colo.
U. S. P. C. Co., Denver, Colo.
Universal P. C. Co., Chicago
Utah Idaho Cement Co., Ogden, Utah
Vulcanite P. C. Co., Philadelphia
Wabash P. C. Co., Detroit
Warrior Cement Corp., Chatta., Tenn.
Wellston Iron Furnace Co., Jackson, Ohio
Wolverine P. C. Co., Coldwater, Mich.
Wyandotte P. C. Co., Detroit

CEMENT BLOCK MACHINES
Abrams Cement Tool Co., Detroit, Mich.
Cement Block Machy. Co., Newark, N. J.
Zagelmeyer Cast Stone Block Machy Co., Bay City, Mich.

CEMENT GUNS
Cement-Gun Co., Allentown, Pa.

CEMENT INSPECTION (See Inspecting Laboratories)

CEMENT TOOLS
*American Fork & Hoe Co., Cleveland
Abrams Cement Tool Co., Detroit

CENTRIFUGAL PUMPS (See Pumps, Centrifugal)

CHAINS
Amer. Chain Co., Inc., Bridgeport, Conn.
Chain Belt Co., Milwaukee, Wis.
Columbus McKinnon Chain Co., Columbus, O.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
U. S. Chain & Forge Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CHIMNEYS, CONCRETE
Heine Chimney Co., Chicago
Rust Engineering Co., Pittsburgh, Pa.
Weber Chimney Co., Chicago

CHIMNEYS, RADIAL BRICK
Amer. Chimney Corp., N. Y.
Continental Chimney Co. of Chicago, Chicago
Alphons Custodis Chimney Const. Co., N. Y.
Heine Chimney Co., Chicago
H. R. Heinicke, Inc., Indianapolis, Ind.
M. W. Kellogg & Co., N. Y.
Rust Eng. Co., Pittsburgh, Pa.

CHIMNEYS, STEEL (See Stacks, Steel)

CHISELS, CHIPPING
*Cleveland Steel Tool Co., Cleveland, Ohio

CHLORINATORS
*Wallace & Tiernan Co., Inc., Newark, N. J.
Norwood Engr. Co., Florence, Mass.
Paradon Mfg. Co., Arlington, N. J.

CHLORINE, LIQUID
(See Liquid Chlorine)

CHUTES, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.

CLAMPS & TIES, FORM
*Insley Mfg. Co., Indianapolis
Batavia Clamp Co., Inc., Batavia, N. Y.
Concrete Form-Hold Co., Inc., Culver City, Cal.
Concrete Form Tie Corp., Pittsburgh, Pa.
Exy-Set Wall Tie Co., Dayton, O.
W. A. Kuhlman & Co., Toledo
M. & M. Wire Clamp Co., Minneapolis
James L. Taylor Mfg. Co., Poughkeepsie, N. Y.
Wedgit Tie Co., Inc., New York

CLAMPS, COLUMN
*Ellis & Ford Mfg. Co., Detroit, Mich.
*Insley Mfg. Co., Indianapolis, Ind.
Black Bros. Co., Mendota, Ill.
Concrete Eng. Co., Omaha, Neb.
Handy Mfg. Co., Chicago
Kardong Bros., Inc., Minneapolis
W. A. Kuhlman & Co., Toledo, Ohio
M. & M. Wire Clamp Co., Minneapolis
The O. D. G. Co., Owensboro, Ky.
J. E. Porter Corp., Ottawa, Ill.
H. W. Roos Co., Cincinnati
Steelform Contracting Co., San Francisco
Sterling Wheelbarrow Co., Milwaukee
Symons Clamp & Mfg. Co., Chicago
James L. Taylor Mfg. Co., Poughkeepsie, N. Y.
Universal Form Clamp Co., Chicago
Wedgit Tie Co., Inc., New York

CLAY DIGGERS, PNEUMATIC
*Independent Pneu. Tool Co., Chicago
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., New York
Gardner-Denver Co., Quincy, Ill.
Ingersoll-Rand Co., New York

CLAY PIPE
(See Pipe, Vitrified Clay)

CLIPS, WIRE ROPE
*Amer. Steel & Wire Co., Chicago
Amer. Hoist & Derrick Co., St. Paul, Minn.
Fischer & Hayes Rope & Steel Co., Chicago
Hazard Wire Rope Co., Wilkesbarre, Pa.
Thos. Laughlin Co., Portland, Me.
Marion Malleable Iron Works, Marion, Ind.
C. M. Mockbee & Co., Cincinnati, Ohio
John A. Roebling Sons Co., Trenton, N. J.
Upson-Walton Co., Cleveland, Ohio

CLUTCHES
*Brown Clutch Co., Sandusky, Ohio
*Twin Disc Clutch Co., Racine, Wis.
*Waukesha Motor Co., Waukesha, Wis.
Brown-Lipe Gear Co., Syracuse, N. Y.
Link-Belt Co., Chicago

COCKS, CURB AND CORPORATION
Chapman Valve Mfg. Co., Indian Orch'd, Mass.
Glauber Brass Mfg. Co., Cleveland, Ohio
Haydenville Co., Haydenville, Mass.
Hays Mfg. Co., Erie, Pa.
Mueller Co., Decatur, Ill.
Union Wtr. Mtr. Co., Worcester, Mass.

COMPRESSORS, AIR (See Air Compressors)

CONCRETE BLOCK MACHINES (See Cement Block Machines)

CONCRETE CURING
*Barber Asphalt Co., Philadelphia
*Dow Chemical Co., Midland, Mich.
*McEverlast, Inc., Los Angeles, Calif.
*Pittsburgh Plate Glass Co., Barberton, Ohio
*Solvay Sales Corp., New York

CONCRETE HEATERS
*Chamsse Oil Burner Co., Elkhart, Ind.
*Connery & Co., Philadelphia, Pa.
*Alex. Milburn Co., Baltimore, Md.
Aeroil Burner Co., West New York, N. J.
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros., Cincinnati

CONCRETE MIXERS
*Amer. Com. Mchy. Co., Inc., Keokuk, Iowa
*Atlas Engineering Co., Clintonville, Wis.
*Jaeger Mach. Co., Columbus, Ohio
*Koehring Co., Milwaukee, Wis.
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*John Lauson Mfg. Co., New Holstein, Wis.
*Ransome Con. Mchy. Co., Dunellen, N. J.
Acme Rd. Machy. Co., Frankfort, N. Y.
Anchor Mfg. Co., Chicago
Archer Iron Works, Chicago
Badger Con. Mixer Co., Milwaukee
Chain Belt Co., Milwaukee, Wis.
Construction Mchy. Co., Waterloo, Iowa
Norris K. Davis, San Francisco, Calif.
J. B. Foote Fdry. Co., Fredericktown, Ohio
Gray Iron Fdry. Co., Reading, Pa.
Judy Mfg. Co., Centerville, Iowa
Knickerbocker Co., Jackson, Mich.
Kwik-Mix Concrete Mixer Co., Port Washington, Wis.
Leach Co., Oshkosh, Wis.
Mixermobile Co., Milwaukee
Orr & Sembower, Reading, Pa.
Remmel Mfg. Co., Kewaskum, Wis.
Republic Iron Works, Tecumseh, Mich.
T. L. Smith Co., Milwaukee

CONCRETE PAVERS (See Pavers, Concrete)

CONCRETE PILING (See Piling)

CONCRETE PIPE (See Pipe, Concrete)

CONCRETE REINFORCEMENT
*American Steel & Wire Co., Chicago
*Truscon Steel Co., Youngstown, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Concrete Steel Co., N. Y.
Consolidated Exp. Metal Co., Wheeling, W. Va.
Electric Welding Co., Pittsburgh, Pa.
Ft. Pitt Bridge Works, Pittsburgh, Pa.
Genfire Steel Co., Youngstown, Ohio
Inland Steel Co., Chicago
Kalman Steel Co., Chicago
Laclede Steel Co., St. Louis, Mo.
National Steel Fabric Co., Pittsburgh
Republic Iron & Steel Co., Youngstown, Ohio
J. T. Ryerson & Son, Chicago
Wickwire-Spencer Steel Co., N. Y.
Youngstown Pressed Steel Co., Warren, Ohio

CONCRETE ROAD FINISHERS
*Blaw-Knox Co., Pittsburgh, Pa.
*A. W. French & Co., Chicago
*Heltzel Steel Form & Iron Co., Warren, Ohio
*Lakewood Eng. Co., Cleveland, Ohio

CONDENSERS
*Allis-Chalmers Mfg. Co., Milwaukee
Ingersoll-Rand Co., N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wheeler Cond. & Eng. Co., Carteret, N. J.
Worthington Pump & Machy. Corp., N. Y.

CONDUIT RODS
F. Bissell Co., Toledo, Ohio
Turbine Sewer Mch. Co., Milwaukee
Waldo Bros. & Bond Co., Boston

CONDUITS, UNDERGROUND
Amer. Vitr. Products Co., Akron, Ohio
Johns-Manville, Inc., N. Y.
National Fireproofing Co., N. Y.
Ric-wil Co., Cleveland

CONTRACTORS' EQUIPMENT DEALERS (See Pages 131 to 156)

CONVEYORS, BELT
*Atlas Engineering Co., Clintonville, Wis.
*Austin-Western Rd. Mchy. Co., Chicago
*Barber-Greene Co., Aurora, Ill.
*The Burch Corp., Crestline, Ohio
*Chicago Automatic Conv. Co., Chicago
*Conveying Weigher Co., New York
*Fairfield Engineering Co., Marion, Ohio
*Good Rds. Mchy. Co., Kennett Sq., Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Jos. Honhorst Co., Cincinnati
*Industrial Brownhoist Corp., Cleveland
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland
Chain Belt Co., Milwaukee, Wis.
Gallion Iron Works & Mfg. Co., Gallion, Ohio
Gifford Wood Co., Hudson, N. Y.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
New Holland Mch. Co., N. Holland, Pa.
Northern Conveyor Co., Janesville, Wis.
Samuel Olson & Co., Chicago
Portable Machinery Co., Clifton, N. J.
Robins Conv. Belt. Co., N. Y.
Jas. B. Seaverns Co., Batavia, Ill.
Smith Eng. Wks., Milwaukee
Standard Conv. Co., No. St. Paul, Minn.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Universal Crusher Co., Cedar Rapids, Iowa
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CONVEYORS, BUCKET
*Atlas Engineering Co., Clintonville, Wis.
*Chicago Automatic Conv. Co., Chicago
*Conveying Weigher Co., N. Y.
*Fairfield Engineering Co., Marion, Ohio
*Good Roads Machy. Co., Kennett Sq., Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Jos. Honhorst Co., Cincinnati, Ohio
*Industrial Brownhoist Corp., Cleveland
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, Ohio
H. W. Caldwell & Son, Chicago
Chain Belt Co., Milwaukee, Wis.
Gifford Wood Co., Hudson, N. Y.
Godfrey Conv. Co., Elkhart, Ind.
Guarantee Constn. Co., N. Y.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
New Holland Mach. Co., N. Holland, Pa.
Samuel Olson & Co., Chicago
Republic Rubber Co., Youngstown, Ohio
Robins Conv. Belt Co., N. Y.
Jas. B. Seaverns Co., Batavia, Ill.

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

"We cleaned up a $1500 bonus on this 15-day bonus-penalty job"

"We tackled this 15-day penalty job when other contractors wouldn't touch it, because we had confidence in our BUCYRUS-ERIE B-2 machines," *writes Clement F. Sculley, of St. Paul, Minn.*, "and the reliable performance of these BUCYRUS-ERIES permitted us to save the penalty and earn a bonus of $1500."

As Mr. Sculley has been using BUCYRUS-ERIES for 11 years, it was no surprise to him when these three sturdy B-2 shovels, each sending 82 cu. yds. of material up the ramp per hour, kept 40 trucks on the jump—in spite of the many obstacles encountered—

Maintaining a driveway for deliveries from an adjoining store—underpinning a three-story hotel—hauling the excavated material over a temporary bridge—and moving 35,000 yards under such conditions from a space 200 ft. square by 33 ft. deep.

One of Mr. Sculley's B-2 shovels that has been at it for 11 years kept humping right along with the newer machines—with the same reliability.

The trio of BUCYRUS-ERIE "B-2" machines of Clement F. Sculley, St. Paul, Minn., handling a penalty-bonus job for C. F. Haglin & Sons, Minneapolis, contractors.

Extra Speed and Strength for rush work

Every time you need extra output, you appreciate the greater Speed and Reliability of your BUCYRUS-ERIES more than ever.

There's extra strength in every part where strength counts most in the hard work. You get the *Reliability* that so often makes the difference between a Bonus or a Penalty.

Write for our Bulletin "S-80" giving reports from users on the performance of their "B-2's"—with photographs of these sturdy diggers on work like your own.

BUCYRUS-ERIE COMPANY

Plants: South Milwaukee, Wis.; Erie, Pa.; Evansville, Ind.

General Offices: South Milwaukee, Wis.

Representatives throughout the U. S. A. and Canada

Offices and distributors in all the principal Countries of the World

BUCYRUS ERIE

BRANCH OFFICES:

Boston	Birmingham	Chicago
New York	Pittsburgh	St. Louis
Philadelphia	Buffalo	Dallas
Atlanta	Detroit	San Francisco

Adv. 756

Where to Purchase

CONVEYORS, BUCKET (Continued)
Stephens Adamson Mfg. Co., Aurora, Ill.
Universal Crusher Co., Cedar Rapids, Iowa
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CONVEYORS, GRAVITY
Lamson Co., Syracuse, N. Y.
Logan Co., Louisville, Ky.
Mathews Conveyor Co., Elwood City, Pa.
Standard Conv. Co., No. St. Paul, Minn.

COUPLINGS, HOSE, AIR AND WATER
*C. B. Hunt & Son, Salem, O.
*Independent Pneumatic Tool Co., Chicago
Cleveland Pneum. Tool Co., Cleveland, Ohio
Gilman Mfg. Co., East Boston, Mass.
Ingersoll-Rand Co., N. Y.
W. H. Keller, Inc., Grand Haven, Mich.
Maleonroy Co., Philadelphia

CRANES, CRAWLER
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Manitowoc Engr. Works, Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
*Trackson Co., Milwaukee
*Universal Crane Co., Lorain, Ohio
Austin Machy. Corp., Muskegon, Mich.
Byers Mach. Corp., Muskegon, Mich.
General Excavator Co., Marion, Ohio
Link-Belt Co., Chicago
McMyler Interstate Co., Cleveland
Mead-Morrison Mfg. Co., Boston
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Star Drilling Mach. Co., Akron, Ohio

CRANES, LOCOMOTIVE
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Koehring Co., Milwaukee
*Manitowoc Engr. Works, Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Parsons Co., Newton, Iowa
*Thew Shovel Co., Lorain, Ohio
Amer. Hst. & Derrick Co., St. Paul, Minn.
Browning Crane Co., Cleveland, Ohio
Davenport Loc. Works, Davenport, Iowa
Link-Belt Co., Chicago
Loc. Crane Co. of Amer., Champaign, Ill.
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Northwest Eng. Works, Chicago
Ohio Loc. Crane Co., Bucyrus, Ohio
Orton Crane & Shovel Co., Chicago
Jas. B. Seaverns Co., Batavia, Ill.
Speeder Mchy. Corp., Cedar Rapids, Iowa
U. S. Crane Co., Chicago

CRANES, ONE-TON
Hughes-Keenan Co., Mansfield, Ohio
Otis Eng. Co., New York
Sterling Tractor Equipment Co., New York
Whitehead & Kales Co., Detroit, Mich.

CRANES, OVERHEAD TRAVELING
*Erie Steel Const'n. Co., Erie, Pa.
Alliance Mach. Co., Alliance, O.
Chesapeake Iron Wks., Baltimore, Md.
Chisholm-Moore Mfg. Co., Cleveland
Curtis Pn. Mchy. Co., St. Louis
Harnischfeger Corp., Milwaukee, Wis.
Milwaukee Elec. Crane Co., Milwaukee
Morgan Eng. Co., Alliance, O.
Northern Eng. Wks., Detroit, Mich.
Shaw Crane Wks., Muskegon, Mich.
Shepard Elec. Cr. & Hst. Co., Montour Falls, N. Y.
Toledo Crane Co., Bucyrus, O.
Whiting Fdry. & Equip. Co., Harvey, Ill.

CRANES, TRUCK
*Universal Crane Co., Lorain, Ohio
Atlas Sales Corp., New York
Bay City Fdry. & Mach Co., Bay City, Mich.
Browning Crane Co., Cleveland
Byers Mach. Co., Ravenna, O.
Erated Mfg. Co., Portland, Ore.
Orton Crane & Shovel Co., Chicago
Harnischfeger Corp., Milwaukee, Wis.

CRANES, WRECKING
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
Industrial Wks., Bay City, Mich.

CRAWLER ATTACHMENTS
*Geo. Haiss Mfg. Co., N. Y.
*Trackson Co., Milwaukee, Wis.
Belle City Mfg. Co., Racine, Wis.
Link-Belt Co., Chicago

CREEPER WHEELS
Creeper Wheel Co., Reading, Pa.

CREOSOTED BLOCKS, TIMBER, ETC.
Amer. Creos. Co., Inc., Louisville, Ky.
Amer. Creos. Wks., Inc., New Orleans, La.
Ayer & Lord Tie Co., Chicago
Carter Blexonead Flooring Co., K. City, Mo.
Colonial Cre. Co., Inc., Louisville, Ky.
Compressed Wood Preserv. Co., Cincinnati, O.
Creos. Materials Co., New Orleans, La.
Georgia Creos. Co., Louisville, Ky.
Jennison-Wright Co., Toledo, O.
Long Bell Lumber Co., Kansas City, Mo.
Midland Creos. Co., Granite City, Ill.
Pensacola Creosoting Co., Pensacola, Fla.
Republic Creos. Co., Indianapolis, Ind.
Southern Wood Pres. Co., Atlanta, Ga.
Wyckoff Pipe & Creos. Co., N. Y.

CRUSHERS, ROCK
*Austin-Western Rd. Mach. Co., Chicago
*Good Rds. Machy. Co., Kennett Sq., Pa.
Acme Rd. Machy. Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago
Galion Ir. Wks. & Mfg. Co., Galion, O.
New Eng. Road Machy. Co., So. Boston, Mass.
New Holland Mach. Co., New Holland, Pa.
Russell Grader Mfg. Co., Minneapolis
Smith Eng. Wks., Milwaukee
Sturtevant Mill Co., Boston
Universal Crusher Co., Cedar Rapids, Ia.
Universal Rd. Mchy. Co., Kingston, N. Y.
Wheeling Mold & Fdry. Co., Wheeling, W. Va.

CULVERTS, CAST IRON
*U. S. Pipe & Fdry. Co., Burlington, N. J.
American Casting Co., Birmingham, Ala.
Amer. C. I. Pipe Co., Birmingham, Ala.
Beach Mfg. Co., Charlotte, Mich.
Galion Iron Wks. & Mfg. Co., Galion, O.
Gilbert Mfg. Co., Aberdeen, S. D.
R. D. Wood & Co., Philadelphia

CULVERTS, CORRUGATED METAL
*Armco Culvert Mfrs. Assn., Middletown, O.
*Austin-Western Rd. Mach. Co., Chicago
*Good Rds. Mach. Co., Kennett Sq., Pa.
American Casting Co., Birmingham, Ala.
Austin Mfg. Co., Chicago
Bark River Bridge & Culv. Co., Bark River, Mich.
Beach Mfg. Co., Charlotte, Mich.
Beatrice Steel Tank Mfg. Co., Beatrice, Neb.
Berger Mfg. Co., Jacksonville, Fla.
Boardman Co., Okla. City, Okla.
Burnham Mfg. Co., Woods Cross, Utah
Calif. Corr. Culv. Co., W. Berkeley, Cal.
Canada Ingot Ir. Co., Ltd., Guelph, Ont.
Canton Culv & Silo Co., Canton, O.
Corr. Culv. Co., Moberly, Mo.
Decatur Cornice & Roofing Co., Albany, Ala.
Dixie Culv. & Metal Co., Atlanta, Ga.
Dixie Culv. Mfg. Co., Little Rock, Ark.
Edwards Mfg. Co., Cincinnati
Galion Iron Wks. & Mfg. Co., Galion, O.
Gilbert Mfg. Co., Aberdeen, S. D.
R. Hardesty Mfg. Co., Denver, Colo.
Highway Prod. & Mfg. Co., Elmira, N. Y.
Ind. Corr. Culv. Co., Mason City, Ia.
Iowa Pure Ir. Co., Des Moines, Ia.
Kentucky Culvert Mfg. Co., Louisville, Ky.
Klauer Mfg. Co., Dubuque, Ia.
Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
Md. Culv. & Metal Co., Baltimore
N. E. Metal Culv. Co., Palmer, Mass.
Nebraska Culv. & Mfg. Co., Wahoo, Neb.
New England Metal Culvert Co., Nashua, N. H.
Newport Culvert Co., Newport, Ky.
Northfield Ir. Co., Northfield, Minn.
Northwest'n Sheet & Ir. Wks., Wahpeton, N.D.
Ohio Corr. Culv. Co., Middletown, O.
W. Q. O'Neall Co., Crawfordsville, Ind.
Pure Iron Culvert & Mfg. Co., Portland, Ore.
Road Supply & Metal Co., Topeka, Kan.
St. Paul Corr. Co., St. Paul, Minn.
Sioux Falls Metal Culv. Co., Sioux Falls, S. D.
So. Metal Culv. Co., Salisbury, N. C.
Spokane Culv. & Tank Co., Spokane, Wash.
Tenn. Metal Culv. Co., Nashville
U. S. Br. & Culv. Co., Bay City, Mich.
Virginia Culvert Corp., Roanoke, Va.
Western Metal Mfg. Co., Houston, Tex.
Wheeling Corr. Co., Wheeling, W. Va.
Wyatt Metal & Blr. Wks., Dallas, Tex.

CULVERT FORMS
*Blaw-Knox Company, Pittsburgh, Pa.
*Holtzel Steel Form & Iron Co., Warren, O.
Concrete Form Co., Inc., Syracuse, N. Y.
Northfield Iron Co., Northfield, Minn.

CURB BOXES
H. W. Clark Co., Mattoon, Ill.
J. B. Clow & Sons, Chicago
Columbian Iron Wks., Chattanooga, Tenn.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Madison Fdry. Co., Cleveland, O.
Mueller Co., Decatur, Ill.
J. S. Schofield's Sons Co., Macon, Ga.
R. D. Wood & Co., Philadelphia, Pa.

CURB, GUTTER AND BASE FORMS (See Forms, Concrete)

CURB GUARDS, STEEL
W. S. Godwin Co., Baltimore

CURB, STEEL PROTECTED
*Truscon Steel Co., Youngstown, O.
Concrete Steel Co., N. Y.

CURING OF CONCRETE
*Barber Asphalt Co., Philadelphia
*Dow Chemical Co., Midland, Mich.
*McEverlast, Inc., Los Angeles, Calif.
*Pittsburgh Plate Glass Co., Barberton, Ohio
*Solvay Sales Corp., N. Y.

CUTTERS, PIPE, HAND
*Ellis & Ford Mfg. Co., Detroit
Armstrong Mfg. Co., Bridgeport, Ct.
Barnes Tool Co., New Haven, Ct.
Erie Tool Works, Erie, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Oswego Tool Co., Oswego, N. Y.
Reed Mfg. Co., Erie, Pa.
Walworth Mfg. Co., Boston

CUTTERS, ROD AND WIRE
*Koehring Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carolus Mfg. Co., Sterling, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Helwig Mfg. Co., St. Paul, Minn.
M. & M. Wire Clamp Co., Minneapolis
Morse-Starrett Prod. Co., Oakland, Calif.
Worthington Pump & Mchy. Corp., N. Y.

CUTTING EDGES
*Caterpillar Tractor Co., San Leandro, Cal.
*General Wheelbarrow Co., Cleveland
J. D. Adams & Co., Indianapolis, Ind.
Shunk Mfg. Co., Bucyrus, O.

CUTTING AND WELDING APPARATUS (See Welding Apparatus)

CYLINDER HEADS, RICARDO
*Waukesha Motor Co., Waukesha, Wis.

DERRICKS, GUY AND STIFF-LEG
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N.Y.
*S. Flory Mfg. Co., Bangor, Pa.
*Insley Mfg. Co., Indianapolis, Ind.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Saagen Derrick Co., Chicago
Amer. Hst. & Derrick Co., St. Paul, Minn.
John T. Horton Co., N. Y.
Lakeside Bridge & Steel Co., N. Milwaukee, Wis.
Lidgerwood Mfg. Co., Elizabeth, N. J.
National Hstg. Eng. Co., Harrison, N. J.
Street Bros. Mach. Wks., Chattanooga
Superior Iron Wks., Superior, Wis.
Universal Hstg. Machy. Corp., Buffalo

DERRICKS, PIPE LAYING
*Dobbie Fdry. & Mach. Co., Niagara Falls
Lidgerwood Mfg. Co., Elizabeth, N. J.
Street Bros. Mach. Wks., Chattanooga

DERRICKS, REVOLVING
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
Street Bros. Mach. Wks., Chattanooga

DERRICKS, STEEL
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Hayward Co., N. Y.
*Insley Mfg. Co., Indianapolis, Ind.
Amer. Hst. & Derrick Co., St. Paul
Street Bros. Mach. Wks., Chattanooga
Taylor Port. St. Derrick Co., Chicago

DERRICKS, STEEL PORTABLE
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
Amer. Hst. & Derrick Co., St. Paul
Lidgerwood Mfg. Co., Elizabeth, N. J.
Street Bros. Mach. Wks., Chattanooga

DERRICK FITTINGS
*S. Flory Mfg. Co., Bangor, Pa.
*Hayward Co., N. Y.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
Amer. Hst. & Derrick Co., St. Paul
Lidgerwood Mfg. Co., Elizabeth, N. J.
Street Bros. Mach. Wks., Chattanooga

DIAPHRAGM PUMPING OUTFITS
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*John Lauson Mfg. Co., New Holstein, Wis.

DIESEL ENGINES (See Engines, Oil)

DISTRIBUTORS, TAR AND ASPHALT
*Good Roads Machinery Co., Kennett Sq., Pa.
E. D. Etnyre & Co., Oregon, Ill.
Kinney Mfg. Co., Boston
Municipal Supply Co., So. Bend, Ind.

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

A SET OF BLAW-KNOX STEEL FORMS *built---*

FIFTEEN YEARS of hard service from any piece of construction equipment is **some** performance.

J. Rasmussen & Sons, Oshkosh, Wisconsin, are at present using 2000 ft. of Blaw-Know Steel Curb & Gutter Forms which have rendered continuous service since originally bought in 1914.

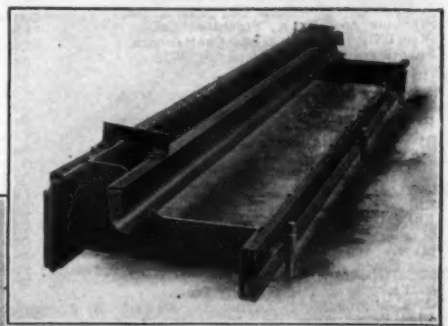
More than **one million lineal feet** of concrete curb and gutter have been formed with this equipment.

This original set of forms is still **intact**—which proves that there is practically no wear-out to Blaw-Knox Steel Forms.

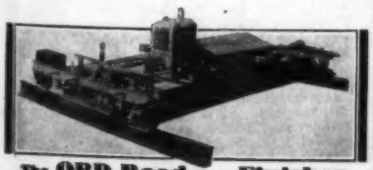
You can also benefit by the economy of STEEL FORMS—BLAW-KNOX Steel Forms for all types of curb, curb and gutter, integral base and curb, and sidewalk construction.

Send for a copy of Catalogue No. 1107—BLAW-KNOX Steel Forms. **Use the Coupon.**

and good for many more seasons of work



Meet Us at the 27th Annual **ROAD SHOW** Atlantic City Auditorium Jan. 11 to 17, 1930



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--It's the double sliding screed that does it.

BLAW-KNOX

BLAW-KNOX

BLAW-KNOX COMPANY
667 Farmers Bank Bldg., Pittsburgh, Pa.
Send me a copy of your Bulletin No. 1107 —Blaw-Knox Street and Sidewalk Forms.
NAME .....
COMPANY .....
STREET .....
CITY ..... STATE .....

Where to Purchase

DISTRIBUTING PLANTS, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, O.
*Ransome Conc. Mchy. Co., Dunellen, N. J.

DITCHING MACHINES (See Excavators)

DOORS AND SHUTTERS, STEEL ROLLING
Cornell Iron Wks., L. I. City, N. Y.
Edwards Mfg. Co., Cincinnati, Ohio
Holzer Sheet Metal Works, New Orleans, La.
Kinnear Mfg. Co., Columbus, O.
James Peters & Son, Philadelphia
St. Paul Corrugating Co., St. Paul, Minn.
Variety Rolling Door Co., Westerville, O.
J. G. Wilson Corp., N. Y.

DRAGS, ROAD
*Austin-Western Road Machinery Co., Chicago
*Caterpillar Tractor Co., San Leandro, Calif.
*General Wheelbarrow Co., Cleveland
*Good Roads Machy. Co., Kennett Square, Pa.
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Beach Mfg. Co., Charlotte, Mich.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, O.
Miskin Scraper Wks., Ucon, Ia.
Slusser-McLean Scraper Co., Sidney, Ohio
Stockland Road Machinery Co., Minneapolis
Western Wheeled Scraper Co., Aurora, Ill.

DRAWING INKS
*Pelican Works, Gunther Wagner, New York
C. M. Higgins & Co., Brooklyn, N. Y.

DREDGES
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Hayward Co., N. Y.
*Osgood Company, Marion, Ohio
Amer. Steel Dredge Co., Ft. Wayne, Ind.
Ellicott Machy. Corp., Baltimore
Marion Steam Shovel Co., Marion, O.
Orton Crane & Shovel Co., Chicago
J. S. Schofield's Sons Co., Macon, Ga.
Stockton Iron Wks., Stockton, Cal.
Street Bros. Mach. Wks., Chattanooga
Superior Iron Wks., Superior, Wis.

DREDGES DIPPER
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Osgood Company, Marion, Ohio
Amer. Steel Dredge Co., Ft. Wayne, Ind.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, O.

DREDGES, HYDRAULIC
*Bucyrus-Erie Co., Erie, Pa.
Ellicott Mach. Corp., Baltimore
Marion Steam Shovel Co., Marion, O.
Morris Mach. Wks., Baldwinsville, N. Y.

DREDGING MACHINERY
*S. Flory Mfg. Co., Bangor, Pa.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Street Bros. Mach. Wks., Chattanooga

DRILL STEEL SHARPENERS (See Sharpeners)

DRILLS, CORE
*Loomis Machine Co., Tiffin, Ohio
*McKiernan-Terry Drill Co., N. Y.
*Sanderson-Cyclone Drill Co., Orrville, O.
*Sullivan Machy. Co., Chicago
Ingersoll-Rand Co., N. Y.

DRILLS, ROCK
*The Buhl Company, Chicago
*Loomis Machine Co., Tiffin, Ohio
*Sanderson-Cyclone Drill Co., Orrville, O.
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., New York
Cleveland Pneum. Tool Co., Cleveland, O.
Cleveland Rock Drill Co., Cleveland, O.
Dallett Co., Philadelphia
Gardner-Denver Co., Quincy, Ill.
Gilman Mfg. Co., E. Boston
Hardsocg Wonder Drill Co., Ottumwa, Ia.
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., New York
W. H. Keller, Inc., Grand Haven, Mich.
Wood Drill Wks., Paterson, N. J.

DRILLS FOR WELLS AND BLAST HOLES (See Well Drilling Machy.)

DRUMS, HOLDING
*Blaw-Knox Co., Pittsburgh, Pa.
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Hayward Co., New York
*Heltzel Steel Form & Ir. Co., Warren, O.
Street Bros. Mach. Wks., Chattanooga

DRYERS, ASPHALT AND CEMENT
*Allis-Chalmers Mfg. Co., Milwaukee
Amer. Blower Co., Detroit, Mich.
Atlas Dryer Co., Cleveland, O.
C. O. Bartlett & Snow Co., Cleveland, O.
F. D. Cummer & Son Co., Cleveland, O.
Lancaster Iron Works, Inc., Lancaster, Pa.
Ruggles-Coles Engineering Co., New York.

DRYERS, SAND AND GRAVEL
*Chausse Oil Burner Co., Elkhart, Ind.
*Jos. Honhorst Co., Cincinnati, O.
Aeroil Burner Co., West New York, N. J.
American Process Co., New York
C. O. Bartlett & Snow Co., Cleveland, O.
Chase & Lyman, Boston
Littleford Bros., Cincinnati, O.
Alex. Milburn Co., Baltimore, Md.

DUMP BODIES FOR CONCRETE
Easton Car & Const. Co., Easton, Pa.
Lee Trailer & Body Co., Plymouth, Ind.

DUMP BODIES FOR MOTOR TRUCKS
*Columbian St. Tank Co., Kansas City, Mo.
*Highway Trailer Co., Edgerton, Wis.
*Wood Hydr. Hoist & Body Co., Detroit
Amer. Prod. & Trad. Co., Chicago
Am. Truck & Body Co., Martinsville, Va.
Anthony Co., Streator, Ill.
Atla Sales Corp., New York
Columbia Body Corp., Columbia, Pa.
Detroit Trailer & Mach. Co., Detroit
Detwiler Mfg. Co., Galion, O.
Eagle Wagon Wks., Auburn, N. Y.
Easton Car & Const. Co., Easton, Pa.
Galion All Steel Body Co., Galion, O.
Griscom-Russell Co., N. Y.
Heil Co., Milwaukee
Herr Dump Car Mfg. Co., Coatesville, Pa.
Hughes-Keenan Co., Mansfield, O.
The Hug Co., Highland, Ill.
Jennings Aut. Dump Body, Roanoke, Va.
Lee Trailer & Body Co., Plymouth, Ind.
Mack Trucks, Inc., N. Y.
Mandt Body Co., Keokuk, Ia.
Marion Steel Body Co., Marion, O.
Martin-Parry Corp., York, Pa.
N. Y. Central Ir. Wks., Hagerstown, Md.
Pechstein Iron Wks., Keokuk, Ia.
Stewart Iron Wks. Co., Cincinnati
Van Dorn Iron Wks. Co., Cleveland, O.

DUMP CARTS AND WAGONS, HORSE
*Austin-Western Road Machy. Co., Chicago
*Caterpillar Tractor Co., San Leandro, Calif.
*Electric Wheel Co., Quincy, Ill.
*Highway Trailer Co., Edgerton, Wis.
Acme Road Machy Co., Frankfort, N. Y.
Acme Wagon Co., Emigsville, Pa.
J. D. Adams & Co., Indianapolis
Austin Mfg. Co., Chicago
Bain Wagon Co., Kenosha, Wis.
Columbia Body Corp., Columbia, Pa.
Eagle Wagon Wks., Auburn, N. Y.
Gilbert Mfg. Co., Aberdeen, S. D.
G. H. Holsbog & Bro., Jeffersonville, Ind.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Little Red Wagon Co., Omaha, Neb.
Luedinghaus-Espenchied Wagon Co., St. Louis
Smith Trailer Co., Syracuse, N. Y.
Stockland Road Machinery Co., Minneapolis
Streich Bros., Oshkosh, Wis.
Western Wheeled Scraper Co., Aurora, Ill.

DUMP WAGONS (ALL STEEL), TRACTOR DRAWN
*Electric Wheel Co., Quincy, Ill.
*Euclid Crane & Hoist Co., Euclid, O.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Smith Trailer Co., Syracuse, N. Y.
Trail-IT Co., St. Paul, Minn.

DYNAMITE (See Explosives)

EARTH BORING EQUIPMENT
*Highway Trailer Co., Edgerton, Wis.

EJECTORS, SEWAGE (See Sewage Ejectors)

ELECTRIC GENERATORS AND MOTORS
*Allis-Chalmers Mfg. Co., Milwaukee
American Motors Co., Cedarburg, Wis.
The Louis Allis Co., Milwaukee
Crocker-Wheeler Co., Ampere, N. J.
Fairbanks, Morse & Co., Chicago
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., New York
Ideal Electric & Mfg. Co., Mansfield, O.
Lincoln Electric Co., Cleveland, O.
Northwestern Mfg. Co., Milwaukee, Wis.
Robbins & Myers Co., Springfield, O.
Wagner Electric Mfg. Co., St. Louis
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC LAMPS
General Electric Co., Schenectady, N. Y.
Westinghouse Lamp Co., N. Y.

ELECTRIC LIGHTING PLANTS
*Allis-Chalmers Mfg. Co., Milwaukee
Climax Eng. Co., Clinton, Ia.
Cook Motor Co., Delaware, O.
Cushman Motor Works, Lincoln, Neb.
Fairbanks, Morse & Co., Chicago
Fuller & Johnson Mfg. Co., Madison, Wis.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., New York
Kohler Co., Kohler, Wis.
Klauer Mfg. Co., Dubuque, Iowa
Sunbeam Electric Mfg. Co., Evansville, Ind.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC TRANSFORMERS
*Allis-Chalmers Mfg. Co., Milwaukee
General Electric Co., Schenectady, N. Y.
Kuhlman Electric Co., Bay City, Mich.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC WIRES (See Wire)

ELEVATORS, BUCKET
*Atlas Engineering Co., Clintonville, Wis.
*Austin-Western Rd. Machy. Co., Chicago
*Conveying Weigher Co., N. Y.
*Fairfield Engineering Co., Marion, Ohio
*Good Rds. Machy. Co., Kennett Sq., Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
Abrams Cement Tool Co., Detroit
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, O.
Chain Belt Co., Milwaukee, Wis.
Gifford-Wood Co., Hudson, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago
Littleford Bros., Cincinnati
New Holland Mch. Co., N. Holland, Pa.
Robins Convertible Belting Co., N. Y.
Spears-Wells Machy Co., Oakland, Cal.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Univ. Rd. Machy. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago
Worthington Pump & Mchy. Corp., N. Y.

ELEVATORS, PASSENGER, FREIGHT, ETC
Am. Elev. & Mach. Co., Louisville, Ky.
Atlantic Elev. Co., Inc., Philadelphia
Bay State Elev. Co., Springfield, Mass.
Haughton Elev. & Mach. Co., Toledo, O.
Llewellyn Ir. Wks., Los Angeles, Cal.
Montgomery Elevator Co., Moline, Ill.
Otis Elevator Co., N. Y.
C. Ridgway & Son Co., Coatesville, Pa.
A. B. See Electric Elevator Co., N. Y.
Speidel Elevator Corp., Reading, Pa.
Warner Elevator Mfg. Co., Cincinnati
Warsaw Elevator Co., Warsaw, N. Y.
Westinghouse Elec. Elevator Co., E. Pittsburgh, Pa.

ENGINES, DREDGING
Murray Iron Works Co., Burlington, Ia.

ENGINES, GAS AND GASOLINE
*Allis-Chalmers Mfg. Co., Milwaukee
*Caterpillar Tractor Co., San Leandro, Cal.
*Continental Motors Corp., Muskegon, Mich.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Electric Wheel Co., Quincy, Ill.
*Evinruds Motor Division, Milwaukee
*Hercules Motors Corp., Canton, O.
*John Lauson Mfg. Co., New Holstein, Wis.
*Le Roi Co., Milwaukee
*Novo Engine Co., Lansing, Mich.
*Sanderson-Cyclone Drill Co., Orrville, O.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Waukesha Motor Co., Waukesha, Wis.
Alamo Engine Co., Hillsdale, Mich.
Beaver Mfg. Co., Milwaukee, Wis.
Buda Co., Harvey, Ill.
Charter Gas Engine Co., Sterling, Ill.
Chicago Pneumatic Tool Co., N. Y.
Climax Engineering Co., Clinton, Ia.
Cook Motor Co., Delaware, O.
Cushman Motor Works, Lincoln, Neb.
Ersted Mfg. Co., Portland, Ore.
Fairbanks Morse & Co., Chicago
Foos Gas Engine Co., Springfield, O.
Fuller & Johnson Mfg. Co., Madison, Wis.
Hinkley Motors, Inc., Detroit
F. Van Rossen Hoogendyk, New York
Ingersoll-Rand Co., New York
Minneapolis Steel & Machinery Co., Minneapolis, Minn.
Servel Mfg. Co., Evansville, Ind.
Sterling Engine Co., Buffalo, N. Y.
Universal Motor Co., Oshkosh, Wis.
Weber Engine Co., Kansas City, Mo.
Wisconsin Motor Mfg. Co., Milwaukee
Witte Engine Works, Kansas City, Mo.
Worthington Pump & Mchy. Corp., N. Y.

ENGINES, HOISTING (See Hoists)

ENGINES, INDUSTRIAL (See Power Plants, Industrial)

ENGINES, KEROSENE
*Electric Wheel Co., Quincy, Ill.
*Hercules Motors Corp., Canton, O.
*John Lauson Mfg. Co., New Holstein, Wis.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Waukesha Motor Co., Waukesha, Wis.
Alamo Engine Co., Hillsdale, Mich.
Climax Engineering Co., Clinton, Ia.
Fuller & Johnson Mfg. Co., Madison, Wis.
Witte Engine Works, Kansas City, Mo.

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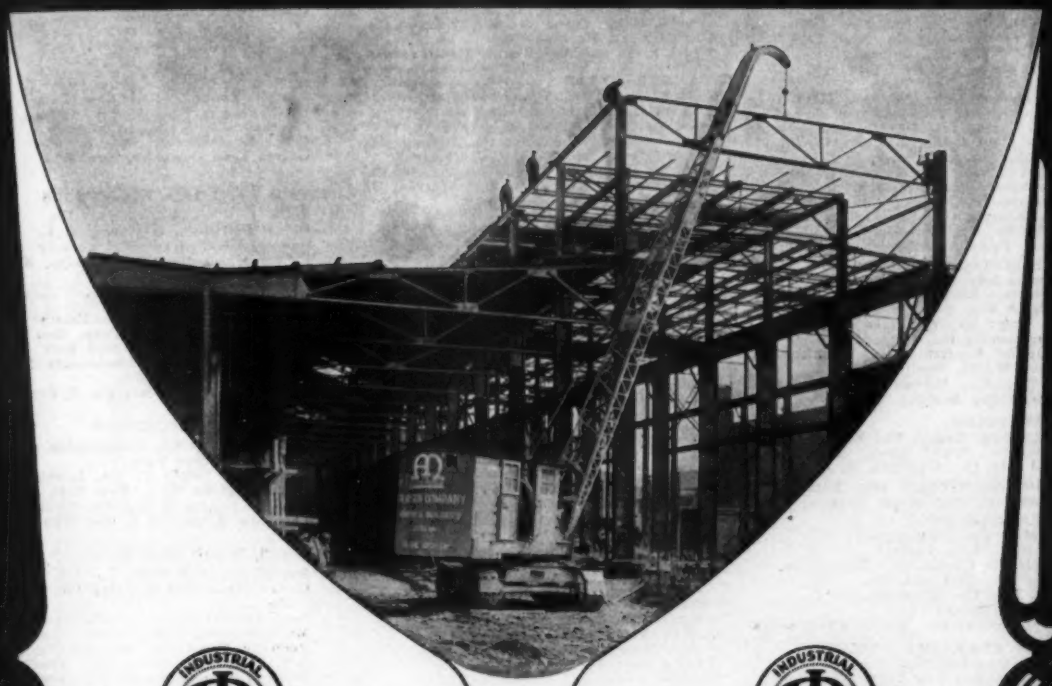
When Time Means Money



The Austin Company does not hesitate to make a contract which provides a penalty clause for the non-completion of a job within a remarkably short time. And they invariably make good because they have an efficient organization, backed up by dependable equipment.

Included in this equipment are five Industrial Brownhoists, the last of which was recently sold to The Austin Company of Texas for use on railroad terminal and hangar work. These crawler cranes are among the first units on the job and are put to work in the unloading, handling and erection of materials. When their work is done, they are easily loaded and shipped to the next job because no dismantling is necessary.

The Austin Company, and many other of the country's leading organizations, are fleet owners of Industrial Brownhoists because they have found that they pay big returns and that their better construction makes them absolutely dependable. There is a size and type that would be equally as efficient on your work.

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland

Plants:

Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio

The Choice of Leading Engineers

Where to Purchase

ENGINES, OIL, DIESEL
*Allis-Chalmers Mfg. Co., Milwaukee
*Stover Mfg. & Eng. Co., Freeport, Ill.
Anderson Engine & Fdry. Co., Anderson, Ind.
Bessemer Gas Eng. Co., Grove City, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buckeye Machinery Co., Lima, O.
Busch Sulzer Bros.-Diesel Eng. Co., St. Louis
Charter Gas Engineering Co., Sterling, Ill.
Chicago Pneumatic Tool Co., New York
De La Vergne Machinery Co., New York
Fairbanks, Morse & Co., Chicago
Fulton Iron Works Co., St. Louis
Ingersoll-Rand Co., New York
Lombard Governor Co., Ashland, Mass.
McIntosh & Seymour Corp., Auburn, N. Y.
Muncie Oil Engine Co., Muncie, Ind.
New London Ship & Eng. Co., Groton, Ct.
Nordberg Mfg. Co., Milwaukee, Wis.
St. Mary's Oil Eng. Co., St. Charles, Mo.
Taylor Machinery Co., Cleveland, O.
F. Van Reesen Heegendyk, New York
Weber Engineering Co., Kansas City, Mo.
Western Machy. Co., Los Angeles, Cal.
Worthington Pump & Mchy. Corp., N. Y.

ENGINES, PUMPING
*Allis-Chalmers Mfg. Co., Milwaukee
*Hercules Motors Corp., Canton, O.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Waukesha Motor Co., Waukesha, Wis.
Climax Engineering Co., Clinton, Ia.
Hooven, Owens, Rentschler Co., Hamilton, O.
Murray Iron Works, Burlington, Ia.
Nordberg Mfg. Co., Milwaukee
Worthington Pump & Mchy. Corp., N. Y.

ENGINES, SWINGING
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
Dake Engine Co., Grand Haven, Mich.
Lidgerwood Mfg. Co., Elizabeth, N. J.

EXCAVATING MACHINERY (See Names Under Excavators, also Steam Shovels)

EXCAVATORS, CABLEWAY
*Beaumont Mfg. Co., Philadelphia
*Sauerman Bros., Inc., Chicago
*Schofield-Burkett Constr. Co., Macon, Ga.
Ersted Mfg. Co., Portland, Ore.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Link-Belt Co., Chicago
Street Bros. Machinery Works, Chattanooga

EXCAVATORS, CRAWLING TRACTOR
*Bucyrus-Erie Co., Erie, Pa.
*Geo. Haiss Mfg. Co., New York
*Trackson Co., Milwaukee, Wis.
*Industrial Brownhoist Corp., Cleveland
*Osgood Company, Marion, Ohio
W. M. Blair Mfg. Co., Chicago, Ill.
Byers Machine Co., Ravenna, O.
General Excavator Co., Marion, Ohio

EXCAVATORS, DITCH AND TRENCH
*Barber-Greene Co., Aurora, Ill.
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Geo. Haiss Mfg. Co., New York
*Hayward Co., New York
*Industrial Brownhoist Corp., Cleveland
*Insley Mfg. Co., Indianapolis, Ind.
*Manitowoc Engr. Wks., Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Parsons Co., Newton, Ia.
*Thew Shovel Co., Lorain, O.
Austin Mach. Corpn., Muskegon, Mich.
Buckeye Tractor Ditcher Co., Findlay, O.
Byers Machine Co., Ravenna, O.
Cleveland Trencher Co., Euclid, O.
Economy Exc. Co., Iowa Falls, Ia.
Ersted Mfg. Co., Portland, Ore.
General Excavator Co., Marion, Ohio
Keystone Driller Co., Beaver Falls, Pa.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, O.
Monighan Machinery Co., Chicago
Ohio Power Shovel Co., Lima, Ohio
Orton Crane & Shovel Co., Chicago
Owensboro Ditcher & Grader Co., Owensboro, Ky.
Speeder Mchy. Corp., Cedar Rapids, Ia.
Star Drilling Machinery Co., Akron, O.
Street Bros. Machine Works, Chattanooga
C. T. Topping Machinery Co., Dayton, O.

EXCAVATORS, DRAG-LINE
*Bay City Shovels, Inc., Bay City, Mich.
*Beaumont Mfg. Co., Philadelphia
*Bucyrus-Erie Co., Erie, Pa.
*L. P. Green, Chicago
*Hayward Co., New York
*Industrial Brownhoist Corp., Cleveland
*Koehring Co., Milwaukee
*Manitowoc Engr. Wks., Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Sauerman Bros., Chicago
*Schofield-Burkett Constr. Co., Macon, Ga.
*Thew Shovel Co., Lorain, O.
Amer. Hoisting & Derrick Co., St. Paul
Austin Machy. Corp., Muskegon, Mich.
Byers Machine Co., Ravenna, O.
Economy Exc. Co., Iowa Falls, Ia.
Ersted Mfg. Co., Portland, Ore.
C. L. Gade, Iowa Falls, Ia.
General Excavator Co., Marion, Ohio
Galion Iron Wks. & Mfg. Co., Galion, O.
Harnischfeger Corp., Milwaukee, Wis.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, O.
Monighan Machine Co., Chicago
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Page Engineering Co., Chicago
Speeder Mchy. Corp., Cedar Rapids, Ia.
Star Drilling Machine Co., Akron, O.
Street Bros. Machine Works, Chattanooga

EXPANDED METAL
*Truscon Steel Co., Youngstown, O.
Berger Mfg. Co., Canton, Ohio
Consolidated Exp. Metal Co., Wheeling, W. Va.
Decatur Cornice & Roofing Co., Albany, Ala.
Northwestern Exp. Metal Co., Chicago
Wheeling Corrugating Co., Wheeling, W. Va.
Youngstown Pressed Steel Co., Warren, O.

EXPANSION JOINT MATERIAL
*Barber Asphalt Co., Philadelphia
*Barrett Co., New York
*Philip Carey Co., Cincinnati, O.
*W. R. Meadows, Inc., Elgin, Ill.
*Truscon Steel Co., Youngstown, O.
Hoosier Asphalt Co., Alexandria, Ind.
Pioneer Asphalt Co., Lawrenceville, Ill.
Servised Products Corp., Chicago
Texas Co., New York
Waring-Underwood Co., Philadelphia

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
Austin Powder Co., Cleveland, O.
Egyptian Powder Co., East Alton, Ill.
E. I. Du Pont De Nemours & Co., Wilmington, Del.
Equitable Powder Mfg. Co., E. Alton, Ill.
Giant Powder Co., San Francisco, Cal.
Grasselli Powder Co., Cleveland, O.
Hercules Powder Co., Wilmington, Del.
Ill. Powder Mfg. Co., St. Louis, Mo.
King Powder Co., Cincinnati, O.
Union Explosives Co., Clarksburg, W. Va.
U. S. Powder Co., Terre Haute, Ind.

FENCING
*American Steel & Wire Co., Chicago
Adrian Wire Fence Co., Adrian, Mich.
Amer. Fence & Const. Co., New York
Anchor Post Fence Co., New York
Cyclone Fence Co., Waukegan, Ill.
Dwiggins Wire Fence Co., Anderson, Ind.
Edwards Mfg. Co., Cincinnati
Ill. Wire & Mfg. Co., Joliet, Ill.
Ind. Steel & Wire Co., Muncie, Ind.
Interlocking Fence Co., Morton, Ill.
Keystone Steel & Wire Co., Peoria, Ill.
Kokomo Steel & Wire Co., Kokomo, Ind.
Mich. Wire Fence Co., Adrian, Mich.
Nitselman Bros., Muncie, Ind.
Page Stl. & Wire Prod. Corp., Bridgeport, Ct.
Pittsburgh Steel Co., Pittsburgh, Pa.
Stewart Ir. Wks. Co., Cincinnati, O.
Tex. Cyclone Fence Co., Ft. Worth, Tex.
Van Dorn Iron Works Co., Cleveland, O.
Wayne Iron Works, Wayne, Pa.
Wickwire-Spencer Steel Co., New York

FILING EQUIPMENT, STEEL
Art Metal Constr. Co., Jamestown, N. Y.
Berger Mfg. Co., Canton, O.
Canton Art Metal Co., Canton
Gen. Fireproofing Co., Youngstown, O.
Van Dorn Iron Works Co., Cleveland, O.

FILTERS, OIL
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.

FILTERS, WATER
Amer. Water Softener Co., Philadelphia, Pa.
Cochran Corp., Philadelphia, Pa.
Graver Corporation, E. Chicago, Ind.
International Filter Co., Chicago
Norwood Engineering Co., Florence, Mass.
Roberts Filter Co., Darby, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.

FINISHING MACHINES, CONCRETE ROAD (See Concrete Road Finishers)

FIRE & POLICE ALARM SYSTEMS
Eagle Signal Sales Corp., Moline, Ill.
Gamewell Co., Newton Upper Falls, Mass.
Sterling Siren Fire Alarm Co., Rochester, N. Y.

FIRE ALARM SIRENS
Erick Electric Siren Co., St. Paul, Minn.
Federal Sign System, Chicago
Hendrie & Bolthoff Mfg. & Sup Co., Denver, Colo.
Holtzer-Cabot Electric Co., Boston
Sterling Siren Fire Alarm Co., Rochester, N. Y.
Union Water Meter Co., Worcester, Mass.

FIRE APPARATUS, MOTOR
Ahrens-Fox Fire Eng. Co., Cincinnati, Ohio
Amer-La France & Foamite Corp., New York
Boyer Fire Apparatus Co., Logansport, Ind.
Brockway Motor Fire Apparatus Co., Cortlandt, N. Y.
Buffalo Fire Appl. Corp., Buffalo, N. Y.
Halo Fire Pump Co., Conshohocken, Pa.
Mack Trucks, Inc., New York
Northern Fire Apparatus Co., Minneapolis, Minn.
Peter Pirsch & Sons Co., Kenosha, Wis.
Prospect Fire Engine Co., Prospect, Ohio
Seagrave Co., Columbus, Ohio
Waterous Fire Eng. Works, St. Paul, Minn.
White Co., Cleveland

FIRE HOSE (See Hose, Fire)

FLEXIBLE JOINTS
*Central Foundry Co., New York
*U. S. Pipe & Fdry. Co., Burlington, N. J.
Coldwell-Wilcox Co., Newburgh, N. Y.
Crane Co., Chicago
United Lead Company, New York

FLOOD LIGHTING PROJECTORS
B. B. T. Corp., Philadelphia, Pa.
Crouse-Hinds Co., Syracuse, N. Y.
General Electric Co., Schenectady
Sperry Gyroscope Co., Brooklyn, N. Y.

FLOOD LIGHTS, PORTABLE
*Alexander Milburn Co., Baltimore
*National Carbide Sales Corp., New York
*Orweld Acetylene Co., New York
General Electric Co., Schenectady, N. Y.
Kohler Co., Kohler, Wis.
Westinghouse El. & Mfg. Co., E. Pittsburgh, Pa.

FLOORING, COMPOSITION
*Barber Asphalt Co., Philadelphia
*Barrett Co., New York
Am. Mason Safety Tr. Co., Lowell, Mass.
Johns-Manville, Inc., New York
Marine Decking & Sup. Co., Philadelphia, Pa.
Franklyn R. Muller & Co., Waukegan, Ill.

FLOORS, WOOD BLOCK
*Barrett Co., New York
Carter Bloxonend Flooring Co., Kansas City, Mo.
Jennison-Wright Co., Toledo, Ohio
Midland Creos. Co., Toledo, Ohio
Republic Creos. Co., Indianapolis, Ind.
Sou. Wood Preserving Co., Atlanta, Ga.
Wyckoff Pipe & Creos. Co., New York

FLUSH TANKS
Pacific Flush Tank Co., Chicago and N. Y.

FLUSHERS, STREET (See Street Flushers and Sprinklers)

FORGES, OIL (Rivet Heating)
Hauck Mfg. Co., Brooklyn, N. Y.
Mead-Morrison Mfg. Co., E. Boston

FORMS, CONCRETE ROAD
*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Lakewood Eng. Co., Cleveland, Ohio
*Truscon Steel Co., Youngstown, Ohio
Hotchkiss Stl. Products Co., Binghamton, N. Y.
Metal Forms Corp., Milwaukee

FORMS, CONCRETE PIPE
*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Steel Form & Iron Co., Warren, O.
Concrete Form Co., Syracuse, N. Y.
Eclipse Mach. Co., Kendallville, Ind.
Martin Iron Works, Los Angeles, Cal.
Quinn Wire & Iron Works, Boone, Iowa

FORMS, MANHOLE, PIPE, SEWER, ETC.
*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio

FORMGRADERS
Ted Carr & Co., Chicago

FOUNTAINS, DRINKING
Jas. B. Clow & Sons, Chicago
Crane Co., Chicago
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Murdock Mfg. & Sup. Co., Cincinnati
Puro San. Dr. Fin. Co., Haydenville, Mass.
Rundle-Spence Mfg. Co., Milwaukee
Stewart Iron Works Co., Cincinnati, Ohio
Halsey W. Taylor Co., Warren, Ohio
Century Brass Works, Belleville, Ill.

FRESNOES (See Scrapers, Rotary)

GAGES, WATER LEVEL
Bristol Co., Waterbury, Conn.
Builders Iron Foundry, Providence, R. I.
W. & L. E. Gurley, Troy, N. Y.
Lunkenheimer Co., Cincinnati, Ohio
Simplex Valve & Meter Co., Phila.
Walworth Mfg. Co., Boston

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

PARSONS announces a NEW machine — the 25

bringing NEW economy for trench work within its range

THE machine that is the right size for the work can always dig the job at lower cost than machines that are too big or not big enough. That's why your medium-size trench work can be handled to better advantage by this new Parsons 25.

Built according to Parsons patented offset design on full-crawler traction, which has already proved its merit through years of service on Parsons 21's and 31's.

Two bucket-line speeds—and two conveyor speeds, combine with four traction speeds for fast digging.

A *single enclosed transmission* with ground shafting and roller bearings, *contains all gearing*, including drive for traction, boom-hoist, conveyor and bucket-line.

Depths to 10 feet—widths from 15½ to 42 inches—speeds up to 12 feet per minute, just the size for most public utility work.

The Parsons 25 has already made good on the severest flint-rock digging, proving its ability to get trench dug at lower cost, and faster than any machine of its size. It's ready to do the same on your jobs. Write for detailed specifications.

THE PARSONS COMPANY
Newton, Iowa
Division of National Equipment Corporation

You now have the choice of three full-crawler machines

PARSONS 21	PARSONS 25	PARSONS 31
Widths.....15½" to 36"	Widths.....15½" to 42"	Widths.....18" to 48"
Depth.....to 7 feet	Depth.....to 10 feet	Depth.....to 12 feet

Where to Purchase

GARBAGE CANS (See Cans)

GARBAGE COLLECTION EQUIPMENT
*Highway Trailer Co., Edgerton, Wis.
Atla Sales Corp., New York City
Detroit Trailer & Mach. Co., Detroit
Fruehauf Trailer Co., Detroit, Mich.
Heil Co., Milwaukee
Geo. H. Holsboz & Bros., Jeffersonville, Ind.
Lee Trailer & Body Co., Plymouth, Ind.
Littleford Bros., Cincinnati
B. Nicoll & Co., New York
Smith Trailer Co., Syracuse, N. Y.
Troy Trailer & Wagon Co., Troy, Ohio

GARBAGE DISPOSAL SYSTEMS
American Beccari Corp., New York
C. O. Bartlett & Snow Co., Cincinnati
Decarie Incinerator Co., L. I. City, N. Y.
Goder Incinerator Corp., Chicago
Hiler Eng. & Const. Co., Brooklyn, N. Y.
Morse-Boulger Destructor Co., New York
Nye Odorless Crematory Co., Macon, Ga.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Superior Incinerator Co. of Dallas, Dallas, Tex.

GASOLINE STORAGE TANKS
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
Chicago Bridge & Iron Works, Chicago
Graver Corp., East Chicago, Ind.
Heil Co., Milwaukee, Wis.
Lancaster Iron Works, Inc., Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Wm. B. Scaife & Sons, Pittsburgh, Pa.
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
United Iron Works, Inc., Kansas City, Mo.
Wayne Co., Fort Wayne, Ind.

GATES, SLUICE
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston, Mass.
Coldwell-Wilcox Co., Newburgh, N. Y.
R. Hardesty Mfg. Co., Denver
Rodney Hunt Machine Co., Orange, Mass.
Ludlow Valve Mfg. Co., Troy, N. Y.

GATES FOR PARKS AND CEMETERIES
Stewart Iron Works Co., Cincinnati, Ohio
Wayne Iron Works, Wayne, Pa.

GLASS, FIREPROOF (See Wire Glass)

GRADERS, ROAD (See Road Graders)

GRADER BLADES
*General Wheelbarrow Co., Cleveland, O.
J. D. Adams & Co., Indianapolis, Ind.
Galion Ir. Works & Mfg. Co., Galion, Ohio
Shunk Mfg. Co., Bucyrus, Ohio

GRAND STANDS, PORTABLE
Circle-A. Prod. Corp., Newcastle, Ind.
Leavitt Mfg. Co., Urbana, Ill.
Wayne Iron Works, Wayne, Pa.

GRATING, STEEL
*Blaw-Knox Co., Pittsburgh
Hendrick Mfg. Co., Carbondale, Pa.

GREASE
*D-A Lubricant Co., Inc., Indianapolis
*Jos. Dixon Crucible Co., Jersey City, N. J.

GRIZZLIES
*Allis-Chalmers Mfg. Co., Milwaukee
Austin Mfg. Co., Chicago
Robins Conv. Belt Co., New York
Smith Engineering Works, Milwaukee
Stephens-Adamson Mfg. Co., Angora, Ill.

GUARD RAIL, HIGHWAY
*Am. Steel & Wire Co., Chicago
*Williamsport Wire Rope Co., Williamsport, Pa.
Cyclone Fence Co., Waukegan, Ill.
W. S. Godwin Co., Baltimore, Md.
Hazard Wire Rope Co., Wilkesbarre, Pa.
J. H. Ramsey, Albany, N. Y.
W. F. Robertson Stl. & Iron Co., Cincinnati
Stewart Iron Works Co., Cincinnati
Wickwire-Spencer Steel Co., New York

HAMMERS, STEAM, PILE (See Pile Hammers, Steam)

HEATING KETTLES (See Kettles)

HITCHES
*Gustav Schaefer Co., Cleveland, Ohio
Detroit Trailer & Machine Co., Detroit
Trail-IT Co., St. Paul, Minn.
Whitehead & Kales Co., Detroit

HOISTS, BELT-DRIVEN
*Amer. Saw Mill Mchy. Co., Hackettstown, N. J.
*Brown Clutch Co., Sandusky, Ohio
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Domestic Engine & Pump Co., Shippensburg, Pa.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
American Hoist & Derrick Co., St. Paul, Minn.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., Boston, Mass.
Street Bros. Mach. Works, Chattanooga
Universal Hoist & Mfg. Co., Cedar Falls, Ia.
Weller Mfg. Co., Chicago
William Hoist Co., Los Angeles, Calif.

HOISTS, CONCRETE, TOWER
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Novo Engine Co., Lansing, Mich.
*Ransome Conc. Mchy. Co., Dunellen, N. J.
English Bros. Machy Co., Kansas City
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., Boston
Street Bros. Mach. Works, Chattanooga

HOISTS, ELECTRIC
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Clyde Iron Works Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*S. Flory Mfg. Co., Bangor, Pa.
*Industrial Brownhoist Corp., Clevelaned
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Novo Engine Co., Lansing, Mich.
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Sullivan Machy. Co., Chicago
Am. Hoist & Derrick Co., St. Paul, Minn.
Chisholm-Moore Co., Cleveland, Ohio
Construction Machy. Co., Waterloo, Ia.
Dake Eng. Co., Grand Haven, Mich.
Norris K. Davis San Francisco, Calif.
English Bros. Machy. Co., Kansas City, Mo.
Erated Mfg. Co., Portland, Ore.
Harnischfeger Corp., Milwaukee
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., Boston
National Hoisting Eng. Co., Harrison, N. J.
Northern Engineering Works, Detroit
Sterling Machinery Corp., Kansas City, Mo.
Street Bros. Mach. Works, Chattanooga
Thomas Elevator Co., Chicago
Treadwell Engineering Co., Easton, Pa.
Universal Hoist & Mfg. Co., Cedar Falls, Iowa
Vulcan Iron Works, Wilkes-Barre, Pa.
Williams Hoist Co., Los Angeles, Calif.

HOISTS, GASOLINE
*Amer. Cement Mach. Co., Inc., Keokuk, Iowa
*Amer. Saw Mill Mchy Co., Hackettstown, N. J.
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee
*Clyde Iron Works Sales Co., Duluth, Minn.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*S. Flory Mfg. Co., Bangor, Pa.
*Lansing Co., Lansing, Mich.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Novo Engine Co., Lansing, Mich.
*O. K. Clutch & Mach. Co., Columbia, Pa.
Am. Hoist & Derrick Co., St. Paul, Minn.
Amer. Mfg. & Eng. Co., Kalamazoo, Mich.
Austin Mfg. Co., Chicago
Beach Mfg. Co., Charlotte, Mich.
Buffalo Hoist & Derrick Co., Buffalo, N. Y.
Construction Machy. Co., Waterloo, Ia.
Dake Eng. Co., Grand Haven, Mich.
Dyrr Mfg. Co., Huntington Park, Calif.
Norris K. Davis San Francisco, Calif.
English Bros. Machy. Co., Kansas City, Mo.
Erated Mfg. Co., Portland, Ore.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., Boston
National Hoisting Eng. Co., Harrison, N. J.
Orr & Sembower, Reading, Pa.
Sterling Machinery Corp., Kansas City, Mo.
Street Bros. Mach. Works, Chattanooga
Thomas Elevator Co., Chicago
Universal Hoist & Mfg. Co., Cedar Falls, Iowa
Williams Hoist Co., Los Angeles, Calif.

HOISTS, HAND
*Beebe Bros., Inc., Seattle, Wash.
*Dobbie Fdy. & Machine Co., Buffalo, N. Y.

HOISTS, PNEUMATIC
*Independent Pneu. Tool Co., Chicago, Ill.
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., New York
Curtis Pneumatic Mchy. Co., St. Louis
Dake Eng. Co., Grand Haven, Mich.
Detroit Hoist & Mach. Co., Detroit
Gardner-Denver Co., Quincy, Ill.
Gilman Mfg. Co., E. Boston, Mass.
Hanna Engineering Works, Chicago
Ingersoll-Rand Co., New York
Mead-Morrison Mfg. Co., Boston
Northern Eng. Works, Detroit, Mich.
Worthington Pump & Mchy. Corp., N. Y.

HOISTS, PORTABLE
*Beebe Bros., Inc., Seattle, Wash.
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee, Wis.
Erated Mfg. Co., Portland, Ore.
Joliet Mfg. Co., Joliet, Ill.
Jas. B. Seaverns Co., Batavia, Ill.

HOISTS, STEAM
*Clyde Iron Works Sales Co., Duluth, Minn.
*S. Flory Mfg. Co., Bangor, Pa.
*J. S. Mundy Hstg. Engine Co., Newark, N. J
*Sullivan Machinery Co., Chicago
Am. Hoist & Derrick Co., St. Paul, Minn.
Dake Eng. Co., Grand Haven, Mich.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Ingersoll-Rand Co., New York
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., Boston
National Hoisting Eng. Co., Harrison, N. J.
Orr & Sembower, Reading, Pa.
Street Bros. Mach. Works, Chattanooga
Thomas Elevator Co., Chicago
Treadwell Engineering Co., Easton, Pa.

HOISTS FOR MOTOR TRUCKS
*Beebe Bros., Inc., Seattle, Wash.
*Brown Clutch Co., Sandusky, Ohio
*Wood Hydr. Hoist & Body Co., Detroit
Atla Sales Corp., New York
Erated Mfg. Co., Portland, Ore.
Heil Co., Milwaukee
Hydr. Hoist Mfg. Co., St. Paul, Minn.
Joliet Mfg. Co., Joliet, Ill.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Van Dorn Iron Works Co., Cleveland, Ohio

HOPPERS, CONCRETE (Aggregate Measuring)
*Blaw-Knox Company, Pittsburgh, Pa.
*Butler Bin Co., Waukesha, Wis.
*Erie Steel Const'n Co., Erie, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.
C. S. Johnson Co., Champaign, Ill.
Jas. B. Seaverns Co., Batavia, Ill.
Superior Engineering Co., Warren, Ohio

HOSE, AIR
*The Buhl Company, Chicago
*Independent Pneu. Tool Co., Chicago
Chicago Pneumatic Tool Co., New York
Cincinnati Rubber Mfg. Co., Cincinnati
Cleveland Rock Drill Co., Cleveland, Ohio
The Dallett Co., Philadelphia, Pa.
Gilman Mfg. Co., East Boston, Mass.
Goodyear Tire & Rubber Co., Akron, Ohio
Ingersoll-Rand Co., New York
Mulconroy Co., Inc., Philadelphia, Pa.
Penna. Flexible Metallic Tubing Co., Phila., Pa
Republic Rubber Co., Youngstown, Ohio
United States Rubber Co., New York

HOSE COUPLINGS (See Couplings, Hose)

HOSE, FIRE
Bi-Lateral Fire Hose Co., Chicago
Eureka Fire Hose Mfg. Co., New York
Fabric Fire Hose Co., New York
B. F. Goodrich Rubber Co., Akron, Ohio
Goodyear Tire & Rubber Co., Akron, Ohio

HOUSE NUMBERS
Hamilton Metal Prod. Co., Hamilton, Ohio
C. H. Hanson Co., Chicago
Niagara Metal Stamping Corp., Niagara Falls, N. Y.

HOUSES, PORTABLE (See Portable Buildings)

HYDRANTS, FIRE
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Columbian Ir. Works, Chattanooga, Tenn.
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve Co., Waterford, N. Y.
Iowa Valve Co., Oskaloosa, Iowa
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Troy, N. Y.
Michigan Valve & Fdry. Co., Detroit
Norwood Eng. Co., Florence, Mass.
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., E. Orange, N. J.
Vogt Bros Mfg. Co., Louisville, Ky.
Waterous Co., St. Paul
R. D. Wood & Co., Philadelphia, Pa.

HYDRAULIC RAMS
Deming Co., Salem, Ohio

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

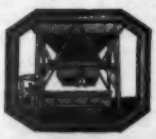
Right thru the year-

with a BUTLER Commercial Concrete Plant

Commercial concrete production is a year 'round business.

Butler Plants—for central mixing or transit mixing—are in successful operation in all parts of the country. Each Butler Commercial Concrete Plant is giving typical Butler satisfactory service.

Our engineering department is in close touch with commercial concrete developments and will be glad to consult with you at any time.



BUTLER BIN COMPANY
WAUKESHA WISCONSIN
Representatives in fifty principal cities

BUTLER
Steel ***BINS***

BUTLER BIN COMPANY · WAUKESHA, WIS.

Johnson Mfg. Co., Seattle, Wash.
Rife Hydraulic Engine Co., New York
Ramsey Pump Co., Seneca Falls, N. Y.

IGNITION SYSTEMS
*Bosch Magneto Corp., New York
American Bosch Magneto Corp., Springfield, Mass.
Dayton Eng. Lab. Co., Dayton, Ohio
Splitdorf Electric Co., Newark, N. J.

INCINERATORS, GARBAGE (See Garbage Disposal)

INDICATOR POSTS (See Valves)

INSPECTING LABORATORIES
*Conard & Busby, Burlington, N. J.
*Fatzig Testing Laboratories, Des Moines, Ia.
Allentown Testing Laboratory, Allentown, Pa.
E. L. Conwell & Co., Philadelphia, Pa.
Gulick-Henderson Co., New York
Robert W. Hunt Co., Chicago, Ill.
New York Testing Lab., New York
Pittsburgh Testing Lab., Pittsburgh

INSTRUMENTS AND SUPPLIES (Surveyors' and Engineers')
Wm. Ainsworth & Sons, Denver, Col.
L. Beckman Co., Toledo, Ohio
C. L. Berger & Sons, Boston
Brandis & Sons Mfg. Co., Brooklyn, N. Y.
Buff & Buff Mfg. Co., Boston
Eugene Dietzgen Co., Chicago
W. & L. E. Gurley, Troy, N. Y.
Keuffel & Esser Co., Hoboken, N. J.
Kolesch & Co., New York
A. Lietz Co., San Francisco
Leupold-Voipel & Co., Portland, Ore.
Lufkin Rule Co., Saginaw, Mich.
Warren-Knight Co., Philadelphia, Pa.
F. Weber & Co., Philadelphia, Pa.
David White Co., Milwaukee, Wis.

INTEGRAL CURB AND BASE FORMS (See Forms, Concrete)

IRON WORK, STRUCTURAL AND ORNAMENTAL, (See Bridges and Buildings)

JACKS, LIFTING
*McKiernan-Terry Drill Co., New York
*Templeton, Kenly & Co., Chicago
Duff Mfg. Co., Pittsburgh, Pa.
Joyce-Cridland Co., Dayton, Ohio
A. O. Norton, Inc., Moline, Ill.
Oil Jack Co., New York
Ross Mfg. Co., Pittsburgh, Pa.
Watson-Stillman Company, New York

JACKS, PIPE FORCING
*Templeton, Kenly & Co., Chicago
Duff Mfg. Co., Pittsburgh, Pa.
Easy Mfg. Co., Lincoln, Neb.

JAIL AND PRISON WORK
Fries & Son Steel Const. & Eng. Co., Covington, Ky.
Manly Jail Works, Dalton, Ga.
Pauly Jail Building Co., St. Louis, Mo.
Southern Prison Co., San Antonio, Tex.
Stewart Iron Works Co., Cincinnati, Ohio
Van Dorn Iron Works Co., Cleveland

JOINTS, EXPANSION PAVING (See Expansion Joint Material)

JOINTS, FLEXIBLE PIPE (See Flexible Joints)

JOISTS, STEEL
*Truscon Steel Co., Youngstown, Ohio
Berger Mfg. Co., Canton, Ohio
Genfire Steel Co., Youngstown, Ohio
Ingalls Steel Prod. Co., Birmingham, Ala.

KETTLES, FOR ASPHALT AND TAR
*Barber Asphalt Co., Philadelphia, Pa.
*Chanute Oil Burner Co., Elkhart, Ind.
*Connery & Co., Inc., Philadelphia, Pa.
*Good Roads Mchy. Co., Kennett Square, Pa.
*Jos. Honhorst Co., Cincinnati, Ohio
*Union Iron Works, Inc., Hoboken, N. J.
Acme Rd. Mach. Co., Frankfort, N. Y.
Aeroil Burner Co., West New York, N. J.
Beach Mfg. Co., Charlotte, Mich.
Charleroi Iron Wks., Charleroi, Pa.
Chase & Lyman, Boston, Mass.
Hauck Mfg. Co., Brooklyn, N. Y.
Kinney Mfg. Co., Boston, Mass.
Lancaster Iron Works, Inc., Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Macleod Co., Cincinnati, Ohio
Spears-Wells Mchy. Co., Oakland, Cal.
G. L. Stuebner Ir. Wks., Inc., Long Island City, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.
Universal Rd. Mach. Co., Kingston, N. Y.

LANTERNS, CONTRACTORS'
*R. E. Dietz Co., New York
*Alex. Milburn Co., Baltimore, Md.
*National Carbide Sales Corp., New York
Defiance Lantern & Stamping Co., Rochester, N. Y.
Economy Electric Lantern Co., Chicago
Handlan, Buck Mfg. Co., St. Louis
National Carbon Co., Inc., New York City
Star Headlight & Lantern Co., Rochester, N. Y.

LATH, METAL
*Truscon Steel Co., Youngstown, Ohio
Berger Mfg. Co., Canton, Ohio
Bostwick Steel Lath Co., Niles, Ohio
Consolidated Exp. Metals Co., Wheeling, W.Va.
Decatur Cornice & Roofing Co., Albany, Ala.
Edwards Mfg. Co., Cincinnati
Genfire Steel Co., Youngstown, Ohio
Milwaukee Corr. Co., Milwaukee, Wis.
Northwestern Exp. Metal Co., Chicago
Penn. Metal Co., Boston, Mass.
St. Paul Corr. Co., St. Paul, Minn.
Sykes Metal Lath and Roofing Co., Niles, O.
Wheeling Corr. Co., Wheeling, W. Va.
Youngstown Pressed Steel Co., Warren, O.

LAWN MOWERS
Chadborn & Coldwell Mfg. Co., Newburgh, N.Y.
Coldwell Lawn Mower Co., Newburgh, N. Y.
Gilson Mfg. Co., Port Washington, Wis.
Ideal Power Lawn Mower Co., Lansing, Mich.
Jacobsen Mfg. Co., Racine, Wis.
Modern Mach. Works, Milwaukee
Penna. Lawn Mower Works, Philadelphia, Pa.
Phila. Lawn Mower Co., Philadelphia, Pa.
S. P. Townsend Co., Bloomfield, N. J.
Worthington Mower Co., Stroudsburg, Pa.

LAWN MOWER SHARPENERS
Fate-Root-Heath Co., Plymouth, Ohio

LEAD-MELTING FURNACES
Aeroil Burner Co., West New York, N. J.
Chicago Flexible Shaft Co., Chicago
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros., Cincinnati, Ohio
A. P. Smith Mfg. Co., East Orange, N. J.

LETTERING GUIDES
Wood-Regan Inst. Co., So. Orange, N. J.

LIGHTS, ACETYLENE
*Alex Milburn Co., Baltimore, Md.
*Natl. Carbide Sales Corp., New York
*Oxweld Acytelene Co., New York
General Electric Co., Schenectady, N. Y.
Kohler Co., Kohler, Wis.
Westinghouse El. & Mfg. Co., E. Pittsburgh, Pa.

LIGHTING STANDARDS (See Street Lamp Posts)

LIGHTS, WARNING
*Toledo Pressed Steel Co., Toledo, Ohio
McCloskey Torch Co., Toledo, Ohio
National Carbon Co., New York

LIQUID CHLORINE
Arnold, Hoffman & Co., Inc., New York
Electro Bleaching Gas Co., New York
Hooker Electrochemical Co., New York
Mathieson Alkali Works, Inc., New York
Penna. Salt Mfg. Co., Philadelphia, Pa.

LOADERS, GRAVEL, WAGON, CAR, ETC.
*Atlas Engineering Co., Clintonville, Wis.
*Barber-Greene Co., Aurora, Ill.
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Burch Corp., Crestline, Ohio
*Chicago Automatic Conv. Co., Chicago
*Conveying Weigher Co., New York
*Fairfield Engineering Co., Marion, Ohio
*Geo. Haiss Mfg. Co., N. Y.
*Heltzel St. Form & Ir. Co., Warren, Ohio
*Industrial Brownhoist Corp., Cleveland
*Nelson Iron Works, Passaic, N. J.
*Sauerman Bros., Chicago
*Trackson Co., Milwaukee, Wis.
Bonney Supply Co., Inc., Rochester, N. Y.
Conant Mach. Co., Concord Junct., Mass.
F-S Mfg. Co., New Holstein, Wis.
Gallion Iron Works & Mfg. Co., Gallion, Ohio
Gifford-Wood Co., Hudson, N. Y.
Hughes-Keenan Co., Mansfield, Ohio
Jeffrey Mfg. Co., Columbus, Ohio
Kent Machine Co., Kent, Ohio
Lee Trailer & Body Co., Plymouth, Ind.
Link-Belt Co., Chicago
Logan Co., Louisville, Ky.
New Holland Mch. Co., N. Holland, Pa.
Northern Conveyor Co., Janesville, Wis.
Portable Machinery Co., Clifton, N. J.
H. B. Sackett Screen & Chute Co., Chicago
Spears-Wells Mchy. Co., Oakland, Cal.
Specialty Engineering Co., Philadelphia, Pa.
Star Drilling Mach. Co., Akron, Ohio
Universal Rd. Mach. Co., Kingston, N. Y.
Weller Mfg. Co., Chicago

LOCKERS, STEEL
All-Steel Equip. Co., Aurora, Ill.
Berger Mfg. Co., Canton, Ohio
Durabilt Steel Locker Co., Aurora, Ill.
Durand Steel Locker Co., Chicago
Hart & Hutchinson Co., N. Britain, Conn.
Lyon Metallic Mfg. Co., Aurora, Ill.
Fred. Medart Mfg. Co., St. Louis, Mo.
Narragansett Mach. Co., Providence, R. I.

LOCOMOTIVES, FOR CONTRACTORS, ETC.
Baldwin Loc. Works, Philadelphia, Pa.
Brookville Locomotive Co., Brookville, Pa.
Fate-Root-Heath Co., Plymouth, Ohio
Davenport Loc. Works, Davenport, Iowa
Heisler Locomotive Works, Erie, Pa.
Lima Loc. Works, Lima, Ohio
Mid-West Locomotive Works, Cincinnati
Milwaukee Loc. Mfg. Co., Milwaukee
H. K. Porter Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Geo. D. Whitcomb Co., Rochelle, Ill.

LUBRICANTS
*D-A Lubricant Co., Indianapolis, Ind.
*Joseph Dixon Crucible Co., Jersey City, N. J.
Texas Co., New York

LUBRICATORS
The Bassick Mfg. Co., Chicago
Carr Fastener Co., Cambridge, Mass.

MANGANESE STEEL PRODUCTS
American Manganese St. Co., Chicago H'ts., Ill.
Taylor-Wharton Ir. & St. Co., High Bridge, N.J.

MANHOLE COVERS (See Castings)

METAL LATH (See Lath)

METAL ROOFING (See Roofing)

METER BOXES
Builders Iron Foundry, Providence, R. I.
H. W. Clark Co., Mattoon, Ill.
Clarksville Fdry. & Mach. Co., Clarksville, Tenn.
J. B. Clow & Sons, Chicago
Columbian Iron Works, Chattanooga, Tenn.
Ford Meter Box Co., Wabash, Ind.
Mueller Co., Decatur, Ill.
J. S. Schofield's Sons Co., Macon, Ga.

METER COUPLINGS
*Neptune Meter Co., New York
H. W. Clark Co., Mattoon, Ill.
Ford Meter Box Co., Wabash, Ind.
Hersey Mfg. Co., So. Boston, Mass.
Mueller Co., Decatur, Ill.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Union Water Meter Co., Worcester, Mass.

METER TESTERS
*Neptune Meter Co., New York
H. W. Clark Co., Mattoon, Ill.
Ford Meter Box Co., Wabash, Ind.
Mueller Co., Decatur, Ill.
National Meter Co., New York
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

METERS, ELECTRIC (WATTHOUR)
Duncan Elec. Mfg. Co., LaFayette, Ind.
General Electric Co., Schenectady, N. Y.
Sangamo Electric Co., Springfield, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

METERS, WATER, OIL & GASOLINE
*Neptune Meter Co., New York
Badger Meter Mfg. Co., Milwaukee
Buffalo Meter Co., Buffalo, N. Y.
Federal Meter Corp., E. Orange, N. J.
Gamon Meter Co., Newark, N. J.
Hersey Mfg. Co., Boston, Mass.
National Meter Co., New York
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Phoenix Meter Co., Prince Bay St. Isl., N.Y.
Thomson Meter Corp., New York
Union Water Meter Co., Worcester, Mass.
Worthington Pump & Mchy. Corp., New York

METERS, WATER (VENTURI TYPE)
Builders Iron Fdry., Providence, R. I.
Simplex Valve & Meter Co., Philadelphia, Pa.

MIXERS, CONCRETE (See Concrete Mixers)

MIXERS, GROUT
*Lakewood Eng. Co., Cleveland, Ohio
*Union Iron Works, Inc., Hoboken, N. J.
Kent Mach. Co., Cuyahoga Falls, Ohio
T. L. Smith Co., Milwaukee, Wis.

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

Stone from Storage:

Bins not big enough to hold your stock or over-run?
Pile it on the ground and reclaim it as needed with

The NELSON Q-7 LOADER

AMERICAN ROAD BUILDERS' ASSOCIATION
1930 CONVENTION AND ROAD SHOW
JAN. 13–18
ATLANTIC CITY, N.J.

Low First Cost
Low Operating Cost
Low Maintenance

Rugged, Reliable and Efficient, with strength and power for hard work;

Smooth-running spiral feeders that dig without shock to the machinery;

Stout 3-bearing foot shaft that does not bend and sprockets that stay tight;

Manganese chains and sprockets where abrasive stone is to be handled;

Long-base crawlers that hold it steady and grip the ground when crowding;

Two yard a minute capacity, but only one man needed to run it.

The N. P. NELSON IRON WORKS, Inc.
822 Bloomfield Avenue :: :: Passaic, N. J.

Where to Purchase

MIXERS, MORTAR

*Atlas Engineering Co., Clintonville, Wis.
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Heltzel St. Form & Ir. Co., Warren, Ohio
*Jaeger Machine Co., Columbus, Ohio
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*John Lauson Mfg. Co., New Holstein, Wis.
*Ransome Conc. Mchy. Co., Dunellen, N. J.
Anchor Mfg. Co., Chicago
Archer Iron Works, Chicago
Blystone Mfg. Co., Cambridge Spgs., Pa.
Construction Machy. Co., Waterloo, Iowa
Norris K. Davis, San Francisco, Calif.
Kent Machine Co., Kent, Ohio
Kiel Machine Co., Kiel, Wis.
Knickerbocker Co., Jackson, Mich.
Meill-Blumberg Co., New Holstein, Wis.
T. L. Smith Co., Milwaukee, Wis.
Standard Scale & Sup. Corp., Pittsburgh
Talbot-Flood Mfg. Co., Kansas City, Mo.

MIXERS, PLASTER

*Atlas Engineering Co., Clintonville, Wis.
*Conveying Weigher Co., N. Y.
*Jaeger Machine Co., Columbus, Ohio
*John Lauson Mfg. Co., New Holstein, Wis.
Anchor Mfg. Co., Chicago
Blystone Mfg. Co., Cambridge Spgs., Pa.
Construction Machy. Co., Waterloo, Iowa
Norris K. Davis, San Francisco, Calif.
Essick & Co., Los Angeles, Cal.
Knickerbocker Co., Jackson, Mich.
Meill-Blumberg Co., New Holstein, Wis.
Standard Scale & Sup. Corp., Pittsburgh
Talbot-Flood Mfg. Co., Kansas City, Mo.

MORTAR BOXES

*Blaw-Knox Co., Pittsburgh, Pa.
*General Wheelbarrow Co., Cleveland, Ohio
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Jos. Honhorst Co., Cincinnati, Ohio
Anchor Mfg. Co., Chicago, Ill.
Beatrice Steel Tank Mfg. Co., Beatrice, Neb.
Canton Art Metal Co., Canton, Ohio
Donley Bros. Co., Cleveland, O.
Empire Metal Tank Wks., E. Rochester, N. Y.
Norris K. Davis, San Francisco, Calif.
Littleford Bros., Cincinnati

MOTORCYCLES

Cleveland Motorcycle Co., Cleveland, Ohio
Excelsior Motor Mfg. & Supply Co., Chicago
Harley-Davidson Motor Co., Milwaukee
Indian Motocycle Co., Springfield, Mass.

MOTORS, GASOLINE (See Engines, Gas and Gasoline)

MOTOR TRUCKS

*Dodge Bros., Detroit
*International Harvester Co., Chicago
Acme Motor Truck Co., Cadillac, Mich.
Amer.-La France & Foamite Corp., New York
Atterbury Motor Car Co., Buffalo, N. Y.
Autocar Co., Ardmore, Pa.
Brockway Motor Truck Co., Cortland, N. Y.
Clydesdale Motor Truck Co., Clyde, Ohio
Diamond T. Motor Car Co., Chicago
Duplex Truck Co., Lansing, Mich.
Federal Motor Truck Co., Detroit
Ford Motor Co., Detroit
Four Wheel Drive Auto Co., Clintonville, Wis.
General Motors Truck Co., Chicago
Gramm Motors, Inc., Lima, Ohio
The Hug Co., Highland, Ill.
Indiana Truck Corp., Marion, Ind.
Larabee-Deyo Motor Tr. Co., Binghamton, N.Y.
Luedinghaus-Espenschied Wagon Co., St. Louis
Mack Trucks, Inc., New York
Pierce-Arrow Motor Car Co., Buffalo
Reo Motor Car Co., Lansing, Mich.
Standard Motor Truck Co., Detroit
Sterling Motor Truck Co., Milwaukee
Stewart Motor Corp., Buffalo, N. Y.
Traffic Motor Tr. Co., St. Louis, Mo.
Walter Motor Truck Co., L. I. City, N. Y.
White Co., Cleveland, Ohio
Yellow Truck & Coach Mfg. Co., Chicago

MOULDS, CONCRETE

*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio

MUCKING, MACHINES

Hoar Shovel Co., Duluth, Minn.

NUMBERS, HOUSE (See House Numbers)

OILS, ROAD

*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Co., N. Y.
*Standard Oil Co. (Indiana), Chicago
*Standard Oil Co. (N. Y.), N. Y.
Atl. Ref. & Asph. Corp., Philadelphia, Pa.
Headley Good Roads Co., Philadelphia, Pa.
Pioneer Asph. Co., Lawrenceville, Ill.
Standard Oil Co. (La.), N. Orleans, La.
Standard Oil Co. (N. J.), Newark, N. J.
Texas Company, N. Y.

OXY-ACETYLENE APPARATUS

*Oxweld Acetylene Co., Long Island City, N. Y.
Alex. Milburn Co., Baltimore, Md.

PACKING, WATER PIPE

The Leadite Co., Philadelphia, Pa.
United Lead Company, N. Y.

PAINTING MACHINERY

Binks Spray Equipment Co., Chicago
Chicago Pneumatic Tool Co., New York
De Vilbiss Mfg. Co., Toledo, Ohio
Eclipse Air Brush Co., Newark, N. J.
Hobart Brothers Co., Troy, Ohio
W. N. Matthews Corp., St. Louis
Alex. Milburn Co., Baltimore, Md.
Passche Air Brush Co., Chicago
Simons Paint Spray Brush Co., Dayton, Ohio
Spraco Painting Equip. Co., Boston

PAINTS, METAL PROTECTION

*Barber Asphalt Co., Philadelphia
*Barrett Co., New York
*Carey Co., Philip, Cincinnati
*Jos. Dixon Crucible Co., Jersey City, N. J.
*McEverlast, Inc., Los Angeles, Calif.
*Solvay Sales Corp., New York
Acme White Lead & Color Works, Detroit
Berry Bros., Detroit
Cook Paint & Varnish Co., Kansas City, Mo.
Detroit Graphite Co., Detroit
Detroit White Lead Works, Detroit
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Euclid Chemical Co., Cleveland, Ohio
Hoosier Paint Works, Ft. Wayne, Ind.
Minwax Co., N. Y.
Protexol Corp., Kenilworth, N. J.
Ruberoid Co., N. Y.
Servicised Products Corp., Chicago
Sherwin-Williams Co., Cleveland, Ohio
L. Sonneborn Sons, N. Y.
Toch Brothers, N. Y.
Tropical Paint & Oil Co., Cleveland, Ohio
Truscon Laboratories, Detroit

PARK BENCHES

Logan Co., Louisville, Ky.
Fred J. Meyers Mfg. Co., Hamilton, Ohio
Millersville Supply Co., Millersville, Pa.
Stewart Iron Works Co., Cincinnati, Ohio
Van Dorn Iron Works Co., Cleveland

PAVEMENT BREAKERS (See Breakers)

PAVERS, CONCRETE

*Jaeger Mach. Co., Columbus, Ohio
*Koehring Co., Milwaukee
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.
Chain Belt Co., Milwaukee
Foote Co., Nunda, N. Y.
T. L. Smith Co., Milwaukee

PAVING AND ROAD ROLLERS (See Road and Paving Rollers)

PAVING BLOCKS, CREOSOTED WOOD (See Creosoted Blocks)

PAVING BRICK

Alton Brick Co., Alton, Ill.
Buckeye Shale Brick Co., Cleveland, Ohio
Buffalo Brick Co., Buffalo, Kans.
Cleveland Brick & Clay Co., Cleveland, Ohio
Collinwood Shale Brick Co., Cleveland, Ohio
Corry Brick & Tile Corp., Corry, Pa.
Crescent Brick Co., Pittsburgh, Pa.
Euclid Shale Brick Co., Cleveland, Ohio
Georgia Vit. Brick Co., Augusta, Ga.
Globe Brick Co., E. Liverpool, Ohio
Hammond Fire Brick Co., Fairmount, W. Va.
Hisylvania Coal Co., Columbus, Ohio
Hocking Valley Brick Co., Columbus, Ohio
McAvoy Brick Co., Bridgeville, Pa.
Mayer Brick Co., Bridgeville, Pa.
Metropolis Paving Brick Co., Pittsburgh, Kans.
Metropolitan Paving Brick Co., Canton, Ohio
Mineral Wells Brick Co., Mineral Wells, Tex.
Moberly Paving Brick Co., Moberley, Mo.
Murphysboro Paving Brick Co., Murphysboro, Ill.
Nelson Brick Co., Nelsonville, Ohio
Nelsonville Brick Co., Columbus, Ohio
Patton Clay Mfg. Co., Patton, Pa.
Paxton Brick Co., Watsontown, Pa.
Peebles Paving Brick Co., Portsmouth, Ohio
Peoria Brick & Tile Co., Peoria, Ill.
Purington Paving Brick Co., Galesburg, Ill.
Rose Shale Brick Co., Veedersburg, Ill.
Russell Clay Mfg. Co., Alton, Ala.
So. Clay Mfg., Chattanooga, Tenn.
Springfield Paving Brick, Springfield, Ill.
Sterling Brick Co., Olean, N. Y.
Streator Clay Mfg. Co., Streator, Ill.
Terra Haute Vit. Brick Co., Terre Haute, Ind.
Thornton Fire Brick Co., Clarksburg, W. Va.
Thurber Brick Co., Thurber, Tex.
Toronto Fire Clay Co., Toronto, Ohio
Trinidad Brick & Tile Co., Trinidad, Ohio
United Clay Products Corp., Kansas City
Western Shale Products Co., Ft. Scott, Kans.
Westport Paving Brick Co., Westport, Md.

PAVING MACHINERY (See Road and Paving Machinery)

PAVING GUARDS, STEEL

W. S. Godwin Co., Baltimore, Md.

PAVING MATERIALS (See "Asphalt," "Paving Brick," "Granite Block," etc.)

PAVING MIXERS (See Concrete Mixers)

PAVING TOOLS

*Barber Asphalt Co., Philadelphia, Pa.
*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Co., Philadelphia, Pa.
*Jos Honhorst Co., Cincinnati, Ohio
*Union Iron Works, Inc., Hoboken, N. J.
Asroil Burner Co., West New York, N. J.
W. H. Anderson Tool & Supply Co., Detroit
F. D. Cummer & Sons Co., Cleveland, Ohio
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros. Co., Cincinnati, Ohio
Warren Bros. Co., Boston

PICKS

Hubbard Co., Pittsburgh, Pa
Iron City Tool Works, Pittsburgh
Klein-Logan Co., Pittsburgh
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Verona Tool Works, Verona, Pa.
Warren Tool & Forge Co., Warren, Ohio
Warwood Tool Co., Wheeling, W. Va.
Wyoming Shovel Works, Wyoming, Pa.

PILE DRIVERS

*Brown Clutch Co., Sandusky, Ohio
*Bucyrus-Erie Co., Erie, Pa.
*Clyde Iron Works Sales Co., Duluth, Minn.
*Industrial Brownhoist Corp., Cleveland
*McKiernan-Terry Drill Co., N. Y.
*Union Iron Works, Inc., Hoboken, N. J.
Lidgerwood Mfg. Co., Elizabeth, N. J.
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., East Boston

PILE-HAMMERS, STEAM

*Clyde Iron Works Sales Co., Duluth, Minn.
*Industrial Brownhoist Corp., Cleveland
*McKiernan-Terry Drill Co., N. Y.
*Union Iron Works, Inc., Hoboken, N. J.
*Wemlinger, Inc., N. Y.
National Hoisting Engine Co., Harrison, N. J.
Vulcan Iron Works, Chicago

PILING, CONCRETE

MacArthur Conc. Pile & F'd'n Co., N. Y.
Raymond Concrete Pile Co., N. Y.

PILING, INTERLOCKING STEEL

*Wemlinger, Inc., New York
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh

PILING, STEEL SHEET

*Wemlinger, Inc., New York
Bethlehem Steel Co., Bethlehem, Pa.

PIPE, CAST IRON

*Central Foundry Co., N. Y.
*U. S. Pipe & Foundry Co., Burlington, N. J.
Am. Cast Iron Pipe Co., Birmingham, Ala.
J. B. Clow & Sons, Chicago
Donaldson Iron Co., Emaus, Pa.
John Fox & Co., N. Y.
Glamorgan Pipe & F'dry Co., Lynchburg, Va.
Lynchburg F'dry Co., Lynchburg, Va.
McWane Cast Iron Pipe Co., Birmingham, Ala.
National Cast Iron Pipe Co., Birmingham, Ala.
Warren Foundry & Pipe Co., N. Y.
R. D. Wood & Co., Philadelphia, Pa.

PIPE, CULVERT (See Culverts)

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McKiernan-Terry
PILE HAMMERS

DRIVE or PULL

(Here the job was both Drive and Pull)

THROUGH HEAVY CLAY AND BOULDERS

Clay and boulders make tough going at the best, but the McKiernan-Terry No. 7 came through with a most creditable job, as you see from the report of Chambers, McQuigge & McCaffrey Co., Ltd., on the work of the Port Arthur Pulp and Paper Co., Port Arthur, Ontario.

"We had very little trouble—Everything worked most satisfactorily — and we are now cleaned right up."

What McKiernan-Terry drivers and pullers do for others they'll do for you—in the same satisfactory way.

IN OUR PICTORIAL BULLETIN NO. 37

You'll find more than a hundred interesting and enlightening views of all kinds of jobs in all parts of the world. Why not send for it.

HERE'S THE FULL LINE

—Ten sizes—A hammer for every need.

All ten are the double acting kind, and range from the small 95 lb. No. "O" with high piston speed to the mammoth No. "11-B-2" which drives the largest piles with its 22080 foot-pound blow delivered 120 times a minute.

Five of the intermediate sizes may be reversed and serve as pile pullers. Our No. "7" will pull the largest that are driven. Pulling with a driver is just another source of profit for McKiernan-Terry users—with them you may do the whole job no matter what it is or where.

McKiernan-Terry
Double-Acting Pile Hammers

Don't forget to send for the No. 37 Pictorial Bulletin

McKiernan-Terry Drill Co.

19 Park Row, New York City

Pile Hammers and Accessories—Drilling Machinery

Distributors in all Principal Cities in America and Abroad

Where to Purchase

PIPE, LEAD
United Lead Company, N. Y.

PIPE, REINFORCED CONCRETE
*Newark Concrete Pipe Co., Newark, N. J.
Concrete Products Co., Pittsburgh, Pa.
Core Joint Concrete Pipe Co., Baltimore
Independent Concrete Pipe Co., Indianapolis
Lock Joint Pipe Co., Ampere, N. J.

PIPE, RIVETED STEEL OR IRON
*Connery & Co., Inc., Philadelphia, Pa.
*Jos. Henhorst Co., Cincinnati, O.
Abendroth & Root Mfg. Co., Newburgh, N. Y.
American Spiral Pipe Works, Chicago
Biggs Boiler Works, Akron
Canton Culvert & Silo Co., Canton, O.
Chattanooga Boiler & Tank Co., Chatta., Tenn.
Chicago Bridge & Iron Works, Chicago
East Jersey Pipe Co., N. Y.
Hammond Iron Works, Warren, Pa.
R. Hardesty Mfg. Co., Denver
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, O.
Pittsburgh-Des Moines Steel Co., Pittsb'h, Pa.
Tippett & Wood, Phillipsburg, N. J.
Weller Mfg. Co., Chicago

PIPE, STEEL
Central Tube Co., Pittsburgh, Pa.
Jones & Laughlin Steel Co., Pittsburgh
National Tube Co., Pittsburgh
Republic Iron & Steel Co., Youngstown, O.
South Chester Tube Co., Chester, Pa.
Spang-Chalfont & Co., Pittsburgh, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE, WOOD
American Wood Pipe Co., Tacoma, Wash.
Federal Tank & Pipe Co., Seattle, Wash.
Michigan Pipe Co., Bay City, Mich.
Pacific Pipe & Tank Co., San Francisco
Redwood Mfrs. Co., San Francisco
Standard Wood Pipe Co., Williamsport, Pa.
A. Wyckoff & Sons Co., Elmira, N. Y.

PIPE, WROUGHT IRON
A. M. Byers Co., Pittsburgh, Pa.
Cohoes Rolling Mill Co., Cohoes, N. Y.
Reading Iron Co., Reading, Pa.

PIPE BENDING MACHINES
American Pipe Bending Mach. Co., Boston
Watson-Stillman Co., New York

PIPE COVERING

AIRCELL
*Philip Carey Co., Cincinnati, Ohio
Ehret Mag. Mfg. Co., Valley Forge, Pa.
Johns-Manville, Inc., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
National Asbestos Co., Jersey City, N. J.
Norristown Mag. & Asb. Co., Norristown, Pa.
Sall Mountain Co., Chicago
H. F. Watson Co., Erie, Pa.

85 PER CENT MAGNESIA
*Philip Carey Co., Cincinnati, Ohio
Ehret Mag. Mfg. Co., Valley Forge, Pa.
Johns-Manville, Inc., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Norristown Mag. & Asb. Co., Norristown, Pa.

WOOD
Redwood Mfrs. Co., San Francisco
A. Wyckoff & Son Co., Elmira, N. Y.

PIPE CUTTERS (See Cutters, Pipe, Head)

PIPE FITTINGS
*Central Foundry Co., N. Y.
*U. S. Pipe & Foundry Co., Burlington, N. J.
American Cast Iron Co., Birmingham, Ala.
Builders Iron Foundry, Providence, R. I.
J. B. Clow & Sons, Chicago
Crane Co., Chicago
Donaldson Iron Co., Emaus, Pa.
Lunkenheimer Co., Cincinnati, O.
Mtl. C. I. Pipe Co., Birmingham, Ala.
Reading Steel Casting Co., Inc., Bridgeport, Conn.
Warren Foundry & Pipe Co., N. Y.
R. D. Wood & Co., Philadelphia, Pa.

PIPE HANDLING MACHINERY
Taylor Portable Steel Derrick Co., Chicago

PIPE TAPPING MACHINERY (See Water Main Tapping)

PIPE JOINT COMPOUND (Sewer)
*Philip Carey Co., Cincinnati, Ohio
*Jos. Dixon Crucible Co., Jersey City, N. J.
Atlas Mineral Prod. Co., Mertztown, Pa.
The Leadite Co., Philadelphia, Pa.
Pacific Flush Tank Co., Chicago and N. Y.
Ruberoid Co., New York
Texas Co., New York
Waring-Underwood Co., Philadelphia, Pa.

PIPE JOINT MATERIAL (Cast Iron)
Hydraulic Development Co., Boston
The Leadite Co., Philadelphia, Pa.
United Lead Co., New York

PIPE PUSHERS
*Templeton, Kenly & Co., Chicago
Duff Mfg. Co., Pittsburgh
Easy Mfg. Co., Lincoln, Neb.
Giant Mfg. Co., Council Bluffs, Ia.

PIPE THREADERS
Armstrong Mfg. Co., Bridgeport, Conn.

PLANERS, PNEUMATIC
Tousley Tool Co., Cleveland, Ohio

PLAYGROUND APPARATUS
American Playground Device Co., Anderson, Ind.
Chicago Gymnasium Equipment Co., Chicago
Everwear Mfg. Co., Springfield, O.
Giant Mfg. Co., Council Bluffs, Ia.
Hill-Standard Co., Anderson, Ind.
R. F. Lamar & Co., Pueblo, Colo.
Fred. Medart Mfg. Co., St. Louis, Mo.
Mitchell Mfg. Co., Milwaukee
Patterson-Williams Co., San Jose, Calif.
A. G. Spalding & Bros., Chicopee, Mass.

PLOWS, CONTRACTORS'
*Austin-Western Road Mach. Co., Chicago
*Caterpillar Trac. Co., San Leandro, Cal.
*General Wheelbarrow Co., Cleveland
*International Harvester Co., Chicago
*Roderick Lean Mfg. Co., Mansfield, O.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, O.
Deere & Co., Moline, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, O.
Moline Implement Co., Moline, Ill.
Oliver Chilled Plow Works, South Bend, Ind.
Sidney Steel Scraper Co., Sidney, O.
Slusser-McLean Scraper Co., Sidney, O.
Western Wheeled Scraper Co., Aurora, Ill.
Wiard Plow Co., Batavia, N. Y.

PLOWS, ROAD AND ROOTER
*Austin-Western Road Machinery Co., Chicago
*Caterpillar Tractor Co., San Leandro, Calif.
*General Wheelbarrow Co., Cleveland
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis
American Steel Scraper Co., Sidney, Ohio
Beach Mfg. Co., Charlotte, Mich.
Tod Carr & Co., Chicago
Deere & Co., Moline, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, Ohio
P. B. Hackley Equip. Co., San Francisco
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
Western Wheeled Scraper Co., Aurora, Ill.
Wiard Plow Co., Batavia, N. Y.

PLUMBING SUPPLIES
J. B. Clow & Sons, Chicago
Crane Co., Chicago
Glauber Brass Mfg. Co., Cleveland, O.
J. L. Mott Iron Works, N. Y.
Mueller Company, Decatur, Ill.
Rundle-Spence Mfg. Co., Milwaukee
Walworth Mfg. Co., Boston

PNEUMATIC CONCRETE PLACERS
*Ransome Concrete Machinery Co., Dunellen, N. J.
Cement-Gun Co., Inc., Allentown, Pa.

PNEUMATIC GROUT MIXERS & PLACERS
*Ransome Concrete Machinery Co., Dunellen, N. J.
Cement-Gun Co., Inc., Allentown, Pa.

PORTABLE BUILDINGS
*Blaw-Knox Co., Pittsburgh, Pa.
*Truscon Steel Co., Youngstown, O.
Littleford Bros., Cincinnati, O.

PORTABLE STEEL DERRICKS (See Derricks, Steel Portable)

PORTABLE WOOD WORKERS
*American Saw Mill Machinery Co., Hackettstown, N. J.
Jaeger Portable Power Corp., Detroit
Jones Superior Machine Co., Chicago

PORTLAND CEMENT (See Cement)

POTS, ASPHALT AND TAR, POURING
*Barber Asphalt Co., Philadelphia, Pa.
Acme Road Machinery Co., Frankfort, N. Y.
Beach Manufacturing Co., Charlotte, Mich.
Littleford Bros., Cincinnati, Ohio
Tarrent Mfg. Co., Saratoga Springs, N. Y.

POWDER (See Explosives)

POWER PLANTS, INDUSTRIAL
*Continental Motors Corp., Muskegon, Mich.
*Hercules Motors Corp., Canton, O.
*Sanderson-Cyclone Drill Co., Orrville, O.
*Waukesha Motor Co., Waukesha, Wis.
Alamo Engine Co., Hillsdale, Mich.
Buda Co., Harvey, Ill.
Climax Engine Co., Clinton, Iowa
Hinkley Motors, Inc., Detroit
Servel Mfg. Co., Evansville, Ind.
Wisconsin Motor Co., Milwaukee, Wis.

PULLING MACHINES
*Beebe Bros., Inc., Seattle, Wash.
*Clyde Iron Works Sales Co., Duluth, Minn.
John Waldron Corp., New Brunswick, N. J.

PUMPS, AIR LIFT
*Sullivan Machinery Co., Chicago
American Steam Pump Co., Battle Creek, Mich.
Chicago Pneumatic Tool Co., New York
Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York

PUMPS, CENTRIFUGAL
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*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Evinrude Motor Division, Milwaukee, Wis.
*Homelite Corp., Port Chester, N. Y.
*La Bour Co., Chicago Heights, Ill.
*Novo Engine Co., Lansing, Mich.
*Trench & Marine Pump Co., New York
Aldrich Pump Co., Allentown, Pa.
American Steam Pump Co., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Steam Pump Co., Buffalo, N. Y.
A. S. Cameron Steam Pump Works, New York.
Chain Belt Co., Milwaukee
Chicago Pump Co., Chicago
Cook Motor Co., Delaware, O.
Dayton-Dowd Co., Quincy, Ill.
Dean Bros. Co., Indianapolis
De Laval Steam Turbine Co., Trenton, N. J.
Erie Pump & Engine Works, Medina, N. Y.
Fairbanks, Morse & Co., Chicago
General Electric Co., Schenectady
Goulds Pumps, Inc., Seneca Falls, N. Y.
Humphryes Mfg. Co., Mansfield, Ohio
Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York
Keystone Driller Co., Beaver Falls, Pa.
LeCourtenay Co., Newark, N. J.
Manistee Iron Works, Manistee, Mich.
Morris Machine Works, Baldwinsville, N. Y.
Rumsey Pump Co., Seneca Falls, N. Y.
United Iron Works, Inc., Kansas City, Mo.
Warren Steam Pump Co., Warren, Mass.
Weinman Pump Mfg. Co., Columbus, O.
Wheeler Condenser & Eng. Co., Carteret, N. J.
Worthington Pump & Machinery Corp., N. Y.
Yeomans Bros. Co., Chicago

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*Ralph B. Carter Co., New York
*C. H. & E. Mfg. Co., Milwaukee
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*Evinrude Motor Division, Milwaukee, Wis.
*Homelite Corp., Port Chester, N. Y.
*Jaeger Machine Co., Columbus, Ohio
*La Bour Co., Chicago Heights, Ill.
*John Lauson Mfg. Co., New Holstein, Wis.
*Novo Engine Co., Lansing, Mich.
*Union Iron Works, Hoboken, N. J.
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Aurora Pump & Mfg. Co., Aurora, Ill.
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Buda Co., Harvey, Ill.
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Dayton-Dowd Co., Quincy, Ill.
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Emerson Pump & Valve Co., Alexandria, Va.
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** Indicates that the manufacturer carries an advertisement. See index facing inside back cover.**

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Rumsey Pump Co., Seneca Falls, N. Y.
Standard Scale & Supply Corp., Pittsburgh
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Harris Air Pump Co., Indianapolis
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Midwest Engineering Co., Indianapolis, Ind.
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Trench & Marine Pump Co., New York
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Weinman Pump Mfg. Co., Columbus, O.

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*Novo Engine Co., Lansing, Mich.
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Chain Belt Co., Milwaukee, Wis.
Deming Co., Salem, Ohio
Dorr Co., New York
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Humphryes Mfg. Co., Mansfield, Ohio
Trench & Marine Pump Co., New York
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Witte Engine Works, Kansas City, Mo.

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Morris Machine Works, Baldwinsville, N. Y.
Trench & Marine Pump Co., New York

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Gilbert & Barker Mfg. Co., Springfield, Mass.
Ingersoll-Rand Co., New York
Kinney Mfg. Co., Boston
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

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*Evinrude Motor Division, Milwaukee, Wis.
*Homelite Corp., Port Chester, N. Y.
*Jaeger Machine Co., Columbus, O.
*John Lauson Mfg. Co., New Holstein, Wis.
*Union Iron Works, Hoboken, N. J.
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Humphyres Mfg. Co., Mansfield, Ohio
Jaeger Portable Power Corp., Detroit
Trench & Marine Pump Co., New York

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*Homelite Corp., Port Chester, N. Y.
*Novo Engine Co., Lansing, Mich.
*Trench & Marine Pump Co., New York
*Waukesha Motor Co., Waukesha, Wis.
Alamo Iron Works, San Antonio, Texas
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American Steam Pump Co., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
Chicago Pump Co., Chicago
Dayton, Dowd Co., Quincy, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
Evinrude Motor Co., Milwaukee
Fairbanks, Morse & Co., Chicago
Gardner-Denver Co., Quincy, Ill.
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American Well Works, Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
A. S. Cameron Steam Pump Works, New York
Chicago Pump Co., Chicago
Fairbanks, Morse & Co., Chicago
Humphreyes Mfg. Co., Mansfield, Ohio
Ingersoll-Rand Co., New York
Pacific Flush Tank Co., Chicago and N. Y.
Warren Steam Pump Co., Warren, Mass.
Yeomans Bros. Co., Chicago

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Kinney Mfg. Co., Boston

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Modine Mfg. Co., Racine, Wis.
Racine Radiator Co., Racine, Wis.
Young Radiator Co., Racine, Wis.

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*Independent Pneu. Tool Co., Chicago
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Cleveland Pneumatic Tool Co., Cleveland, O.
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*Cleveland Steel Tool Co., Cleveland, O.
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C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, Ohio
Landreth Machinery Co., Joplin, Mo.
Rome Mfg. Co., Rome, N. Y.
Spears-Wells Machinery Co., Oakland, Cal.
Stockland Road Machinery Co., Minneapolis

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Spears-Wells Machinery Co., Oakland, Cal.
White Co., Cleveland

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ROCK DRILLS (See Drills, Rock)

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H. W. Rohl & Co., Los Angeles, Calif.

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*Buffalo-Springfield Roller Co., Springfield, O.
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*Huber Mfg. Co., Marion, Ohio
*W. A. Riddell Co., Bucyrus, Ohio
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Ames Iron Works, Oswego, N. Y.
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Certain-teed Products Corp., New York
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The Lehon Co., Chicago
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Sifo Products Co., St. Paul, Minn.
L. Sonneborn & Sons, Inc., New York
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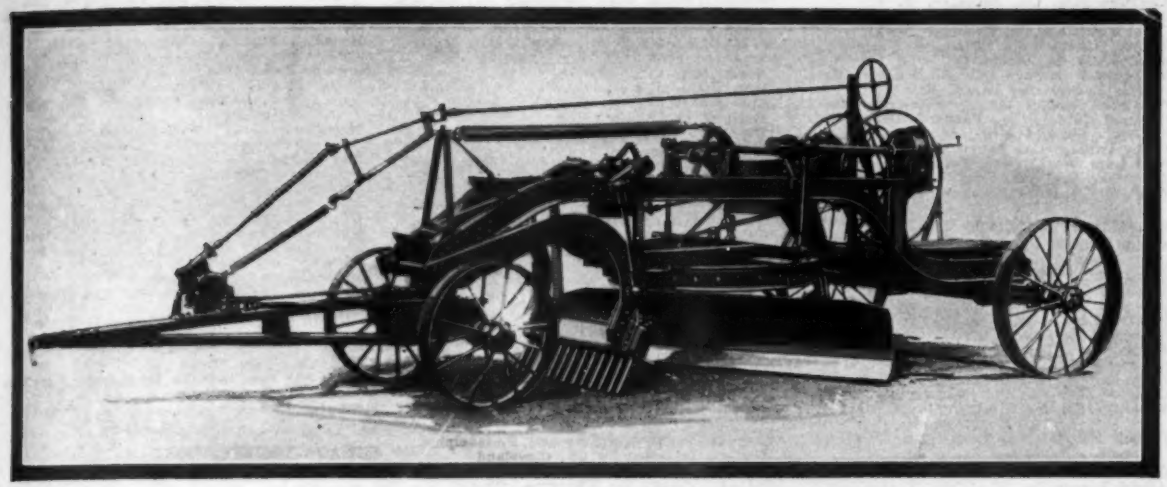

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The Western 55 Grader

is a strong machine for both construction and maintenance

Though designed for use as a road building machine, the Western 55 Grader has the weight and handling ease needed in a heavy maintenance unit.

Capable of working behind tractors rating up to 40 horse-power, the 55 is an ideal two-purpose machine. It is outstanding for its great strength and flexibility.

A few refinements have recently been made that close study and experience have suggested. These include: increased weight in certain members — added reinforcing to increase rigidity—an improved blade lift—improved front and rear axles and a stiffened tongue in the offset engine hitch.

The Western 55 Grader weighs 6200 pounds. Standard equipment includes Alemite lubrication and Timken bearings. It can be equipped with scarifier or backsloper attachments. For complete information on this and other models write The Austin-Western Road Machinery Co., 400 North Michigan Avenue, Chicago, Illinois. Branches in principal cities.

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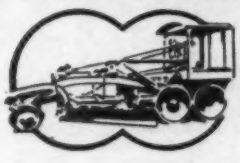
THE NEW  DUAL DRIVE

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Whitlock Cordage Co., New York

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Fischer & Hayes Rope & Steel Co., Chicago
Hazard Wire Rope Co., Wilkesbarre, Pa.
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*Joseph Hornhorst Co., Cincinnati, Ohio
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Littleford Brothers, Cincinnati, Ohio

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Michel Electric Hand Saw Co., Chicago
Portable Power Tool Corp., Warsaw, Ind.
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Reed-Prentice Corp., Worcester, Mass.
F. L. Rogers & Co., Chicago
Skilsaw, Inc., Chicago, Ill.
Wappat Gear Works, Pittsburgh, Pa.
Witte Engine Works, Kansas City, Mo.

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Universal Road Machy. Co., Kingston, N. Y.

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Shunk Mfg. Co., Bucyrus, Ohio

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Keystone Driller Co., Beaver Falls, Pa.

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Case Crane & Engg. Co., Columbus, Ohio
Chattanooga Whlbrw Co., Chattanooga, Tenn.
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Donaldson Bros., Mt. Clemens, Mich.
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Jackson Mfg. Co., Harrisburg, Pa.
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Slusser-McLean Scraper Co., Sidney, Ohio
Stockland Road Machinery Co., Minneapolis
Toledo Wheelbarrow Co., Toledo, Ohio
Western Wheeled Scraper Co., Aurora, Ill.

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SCRAPERS, DRAGLINE
*General Wheelbarrow Co., Cleveland
*Sauerman Bros., Chicago
Beach Mfg. Co., Carlotte, Mich.
Garst Mfg. Company, Chicago
Link-Belt Co., Chicago

SCRAPERS, POWER DRAG
*Beaumont Manufacturing Co., Philadelphia
*General Wheelbarrow Co., Cleveland
*L. P. Green, Chicago
*W. A. Riddell Co., Bucyrus, Ohio
*Sauerman Bros., Chicago
*Schofield-Burkett Constr. Co., Macon, Ga.
Beach Mfg. Co., Charlotte, Mich.
Garst Mfg. Company, Chicago

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Root Spring Scraper Co., Kalamazoo, Mich.

SCRAPERS, ROTARY
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*Baker Mfg. Co., Springfield, Ill.
*Caterpillar Tractor Co., San Leandro, Calif.
*Euclid Crane & Hoist Co., Euclid Village, O.
*Killefer Mfg. Co., Los Angeles, Calif.
*Roderick Lean Co., Mansfield, Ohio
*Gustav Schaefer Co., Cleveland, Ohio
Adams & Co., J. D., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Atlas Scraper Co., Los Angeles, Calif.
Beach Mfg. Co., Charlotte, Mich.
Case Crane & Engg. Co., Columbus, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, O.
H. C. Shaw Co., Stockton, Calif.
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
Solano Iron Works, Berkeley, Calif.
Stockland Road Machy. Co., Minneapolis, Minn.
General Wheelbarrow Co., Cleveland, Ohio
Lyle Culvert & Road Equip. Co., Minneapolis
Miskin Scraper Works, Ucon, Idaho
Root Spring Scraper Co., Kalamazoo
Sidney Steel Scraper Co., Sidney, O.
Stockland Road Machinery Co., Minneapolis
Western Wheeled Scraper Co., Aurora, Ill.

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*Caterpillar Tractor Co., San Leandro, Calif.
*Euclid Crane & Hoist Co., Euclid Village, O.
*General Wheelbarrow Co., Cleveland
*W. A. Riddell Co., Bucyrus, Ohio
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Atlas Scraper Co., Los Angeles, Calif.
Beach Mfg. Co., Charlotte, Mich.
Case Crane & Engg. Co., Columbus, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, Ohio
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Miami Trailer Scraper Co., Troy, Ohio
Miskin Scraper Wks., Ucon, Ia.
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
H. C. Shaw Co., Stockton, Calif.
Stockland Road Machy. Co., Minneapolis, Minn.
Western Wheeler Scraper Co., Aurora, Ill.

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*Austin-Western Road Machinery Co., Chicago
*Chicago Automatic Conv. Co., Chicago
*Good Roads Machinery Co., Kennett Sq., Pa.
*L. P. Green, Chicago
*Geo. Haiss Mfg. Co., New York
Acme Road Machinery Co., Frankfort, N. Y.
Atlas Engineering Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, Ohio
Beach Mfg. Co., Charlotte, Mich.
Brown Hoisting Machy. Co., Cleveland, Ohio
Chain Belt Co., Milwaukee, Wis.
Deister Concentrator Co., Ft. Wayne, Ind.
Galion Iron Works & Mfg. Co., Galion, Ohio
Gifford-Wood Co., Hudson, N. Y.
Hendrick Mfg. Co., Carbondale, Ohio
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
Littleford Bros., Cincinnati, Ohio
Lyle Culvert & Road Equipment Co., Minneapolis, Minn.
Morrow Mfg. Co., Wellston, Ohio
Newago Engineering Co., Newago, Mich.
New Holland Machy. Co., New Holland, Pa.
New Jersey Wire Cloth Co., Trenton, N. J.
Robins Conv. Belt Co., New York
H. B. Sackett Screen & Chute Co., Chicago
Smith Engineering Works, Milwaukee, Wis.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Machine Co., Kingston, N. Y.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago
Wickwire Spencer Steel Co., New York

SCREENS, SEWAGE
Dorr Co., New York
Green Bay Fdry. & Mach. Wks., Green Bay, Wis.
Link-Belt Co., Chicago
Simplex Ejector & Aerator Corp., Chicago

SEWAGE DISINFECTION
*Wallace & Tiernan Co., Inc., Newark, N. J.
Paradon Mfg. Co., Arlington, N. J.

SEWAGE DISPOSAL APPARATUS
Dorr Co., New York
Link-Belt Co., Chicago
Pacific Flush Tank Co., Chicago and N. Y.
Simplex Ejector & Aerator Corp., Chicago

SEWAGE EJECTORS
Pacific Flush Tank Co., Chicago and N. Y.
Simplex Ejector & Aerator Corp., Chicago
Yeomans Bros. Co., Chicago

SEWAGE PUMPS (See Pumps)

SEWER BLOCKS, SEGMENT
American Vit. Products Co., Akron, Ohio
Cannelton Sewer Pipe Co., Cannelton, Ind.
Denver Sewer Pipe & Clay Co., Denver, Col.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Evens & Howard Fire Brick Co., St. Louis, Mo.
Laclede Christy Clay Prod. Co., St. Louis, Mo.
Macomb Sewer Pipe Works, Macomb, Ill.
Pacific Clay Products Co., Los Angeles, Cal.
Red Wing Sewer Pipe Co., Red Wing, Minn.
Robinson Clay Products Co., Akron, Ohio
Standard Fire Brick & Sewer Pipe Co., Pueblo, Col.

SEWER BRACES
*Templeton, Kenly & Co., Chicago

SEWER CLEANING APPARATUS
F. Bissell Co., Toledo, Ohio
Champion Corp., Hammond, Ind.
Hepco Sewer Root Cutter Co., Freeport, Ill.
Self Propelling Nozzle Co., New York
Turbine Sewer Machine Co., Milwaukee

SEWER PIPE AND DRAIN TILE
American Vit. Products Co., Akron, Ohio
Blackmer & Post Pipe Co., St. Louis
William E. Dee Co., Chicago
Denver Sewer Pipe & Clay Co., Denver, Colo.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Evens & Howard Fire Brick Co., St. Louis
Logan Clay Products Co., Logan, Ohio
Ohio Vit. Pipe Co., Uhrichsville, Ohio
Patton Clay Mfg. Co., Patton, Pa.
Red Wing Sewer Pipe Co., Red Wing, Minn.
Robinson Clay Prod. Co., Akron, Ohio
Streator Clay Mfg. Co., Streator, Ill.

SEWER PIPE FORMS (See Forms, Concrete Pipe)

SEWER PIPE JOINT COMPOUNDS
Atlas Mineral Prod. Co., Mertztown, Pa.
Pacific Flush Tank Co., Chicago and N. Y.
Ruberoid Co., New York
Servicised Products Corp., Chicago
Conc. Form Co., Inc., Syracuse, N. Y.
Quinn Wire & Iron Works, Boone, Iowa

SEWER RODS
F. Bissell Co., Toledo, Ohio
Champion Corp., Hammond, Ind.
Turbine Sewer Machine Co., Milwaukee

"Makes the Dirt Fly!"

WHETHER it's smoothing out the chuckholes on a stretch of roadway — grading down some rough ground with a bulldozer — or just plain hauling with dump wagon or scraper train — *"the dirt flies"* when a Cletrac is on the job.

Power is the big factor — and when Cletrac combines it with unyielding traction and the high gear speed of a perfect transmission system, there is no question about results.

Cletrac Crawler Tractors are the standard power units for every phase of road work and general contracting service. For speed, economy and all 'round satisfaction . . . . SELECT A CLETRAC!

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19321 Euclid Avenue Cleveland, Ohio

Write for the big story of Cletrac performance in all types of heavy duty, industrial work.

Where to Purchase

SHARPENERS, DRILL STEEL
*Sullivan Machinery Co., Chicago
Gardner-Denver Co., Quincy, Ill.
Hardsocg Wonder Drill Co., Ottumwa, Iowa
Ingersoll-Rand Co., New York

SHORES
Concrete Engineering Co., Omaha, Neb.
Dayton Sure Grip & Shore Co., Dayton, Ohio
Fischer & Hayes Rope & Steel Co., Chicago
M. & M. Wire Clamp Co., Minneapolis
The O. D. G. Co., Owensboro, Ky.
H. W. Roos Co., Cincinnati, Ohio
Roos-Meyer-Hecht Co., Cincinnati, Ohio
Symons Clamp & Mfg. Co., Chicago
Universal Form Clamp Co., Chicago

SHOVELS, CRAWLING TRACTOR
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Thew Shovel Co., Lorain, Ohio
*Trackson Co., Milwaukee
American Hoist & Derrick Co., St. Paul
Ohio Power Shovel Co., Lima, O.
Speeder Mchy. Corp., Cedar Rapids, Iowa

SHOVELS, ELECTRIC
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
American Hoist & Derrick Co., St. Paul
Byers Mach. Co., Ravenna, Ohio
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, Ohio
Ohio Power Shovel Co., Lima, O.
Speeder Mchy. Corp., Cedar Rapids, Iowa

SHOVELS, GASOLINE
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Insley Mfg. Co., Indianapolis
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
*Trackson Co., Milwaukee
American Hoist & Derrick Co., St. Paul
American Steel Dredge Co., Ft. Wayne, Ind.
Austin Machine Corp., Muskegon, Mich.
Byers Mach. Co., Ravenna, Ohio
General Excavator Co., Marion, Ohio
Harnischfeger Corp., Milwaukee, Wis.
Keystone Driller Co., Beaver Falls, Pa.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., Boston
Northwest Engineering Works, Chicago
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Speeder Mchy. Corp., Cedar Rapids, Iowa
Star Drilling Machine Co., Akron, Ohio
Universal Power Shovel Co., Highland Park, Mich.

SHOVELS, STEAM
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
American Hoist & Derrick Co., St. Paul
Marion Steam Shovel Co., Marion, Ohio
Orton Crane & Shovel Co., Chicago
Keystone Driller Co., Beaver Falls, Pa.

SHOVELS, SPADES AND SCOOPS
American Mfg. Co., Chattanooga, Tenn.
Ames Shovel & Tool Co., Boston
Baldwin Tool Works, Parkersburg, W. Va.
Beall Bros. Co., Alton, Ill.
Connecaut Shovel Co., Connecaut, Ohio
Indiana Shovel Co., New Castle, Ind.
Jackson Shovel Co., Montpelier, Ind.
Pittsburgh Shovel Co., Pittsburgh, Pa.
Wood Shovel & Tool Co., Piqua, Ohio
Wyoming Shovel Works, Wyoming, Pa.

SIDEWALK AND ROAD FORMS (See Forms, Concrete)

SIGNS, STREET AND ROAD
Almoyd Sign & Signal Co., Chicago
Auto Sign Display Co. of Missouri, St. Louis, Mo.
Baltimore Enamel & Novelty Co., Baltimore
Elkhart Foundry & Machine Co., Elkhart, Ind.
Everna-Century Sign Co., Boston
Ingram-Richardson Mfg. Co., Beaver Falls, Pa.
A. D. Joslin Mfg. Co., Manistee, Mich.
Lyle-Signs, Minneapolis, Minn.
Municipal Street Sign Co., New York
Niles Machine Co., Lebanon, N. H.
Persons-Majestic Mfg. Co., Worcester, Mass.
Redflex Signal Co., Cleveland, Ohio
Rochester Street Signal Co., Rochester, N. Y.
Standard Mfg. Co., Cedar Falls, Iowa
Union Iron Products Co., E. Chicago, Ind.
Western Stamping & Mfg. Co., St. Paul

SLEEVES, TAPPING AND VALVE
Mueller Company, Decatur, Ill.
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., East Orange, N. J.

SLUICE GATES (See Gates, Sluice)

SMOKE STACKS (See Chimneys, Steel)

SNOW REMOVAL MACHINERY
*Allis-Chalmers Mfg. Co., Springfield, Ill.
*Austin-Western Road Machinery Co., Chicago
*Baker Mfg. Co., Springfield, Ill.
*Barber-Greene Co., Aurora, Ill.
*Caterpillar Tractor Co., San Leandro, Cal.
*Cleveland Tractor Co., Cleveland, Ohio
*Good Roads Machinery Co., Kennett Sq., Pa.
*George Haiss Mfg. Co., New York
*Killefer Mfg. Co., Los Angeles, Calif.
*N. P. Nelson Iron Works, Passaic, N. J.
*W. A. Riddell Co., Bucyrus, Ohio
*Trackson Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago
Byers Mach. Co., Ravenna, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Fox Rotary Snow Broom Co., New York
Carl H. Frink, Thousand Islands, N. Y.
The Heil Company, Milwaukee, Wis.
Klauer Mfg. Co., Dubuque, Iowa
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Mack Trucks, Inc., New York
Maine Steel Products Co., So. Portland, Me.
Mead-Morrison Mfg. Co., E. Boston
New England Road Machy. Co., So. Boston, Mass.
Owensboro Ditcher & Grader Co, Owensboro, Ky.
Rotary Snow Plow Co., Minneapolis
Walsh's Holyoke St. Bir. Works, Holyoke, Mass.
Walter Snow Fighters, L. I. City, N. Y.
Wausau Iron Wks., Wausau, Wis.

SNOW FENCING
*Good Roads Machinery Co., Kennett Sq., Pa.
American Fence Const. Co., New York
Wickwire-Spencer Steel Co., New York

SPADES (See Shovels)

SPRAYERS, ASPHALT AND TAR
Kinney Mfg. Co., Boston
Littleford Bros., Cincinnati

SPRAYING MACHINERY FOR TREES
John Bean Mfg. Co., Lansing, Mich.
Deming Co., Salem, Ohio
Field Force Pump Co., Elmira, N. Y.
Fitzhenry-Guptill Co., E. Cambridge, Mass.
Friend Mfg. Co., Gasport, N. Y.
Hardie Mfg. Co., Hudson, Mich.

SPRAY PAINTING MACHINERY (See Painting Machinery)

SPREADERS, SAND
*Good Roads Machy. Co., Kennett Square, Pa.
*Warren Bros. Co., Boston, Mass.
Goroco Mechanical Spreader Co., Philadelphia
Highway Service Co., New Bedford, Mass.
Tarrant Co., Saratoga Springs, N. Y.

SPREADERS, STONE
*Austin-Western Road Machinery Co., Chicago
*The Burch Corp., Crestline, Ohio
Galion Iron Works & Mfg. Co., Galion, Ohio
Shaw-Enochs Tractor Co., Minneapolis
Universal Road Machinery Co., Kingston, N. Y.

STACKS, STEEL
*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Inc., Philadelphia
*Heltzel Steel Form & Iron Co., Warren, Ohio
*Joseph Honherst Co., Cincinnati, Ohio
Birmingham Tank Co., Birmingham, Ala.
Canton Art Metal Co., Canton, Ohio
Chattanooga Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Graver Corp., Chicago
Heil Co., Milwaukee, Wis.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
New York Central Iron Works Co., Inc., Hagerstown, Md.
Tippett & Wood, Phillipsburg, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.

STANDPIPES AND ELEVATED TANKS
W. E. Caldwell Co., Louisville, Ky.
Chatta. Bir. & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
R. D. Cole Mfg. Co., Newnan, Ga.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Lancaster Iron Works, Lancaster, Pa.
Pacific Tank & Pipe Co., San Francisco
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
J. S. Schofield's Sons Co., Macon, Ga.
Tippett & Wood, Phillipsburg, Pa.
United Iron Works, Inc., Kansas City, Mo.

STEAM SHOVELS (See Shovels, Steam)

STEEL PLATE CONSTRUCTION
*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Philadelphia
*Heltzel Steel Form & Iron Co., Warren, Ohio
*Joseph Honherst Co., Cincinnati, Ohio
*Union Iron Works, Hoboken, N. J.
Bethlehem Steel Co., Bethlehem, Pa.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Graver Corp., East Chicago, Ill.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Heil Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
McClintic-Marshall Co., Pittsburgh, Pa.
New York Central Iron Works Co., Inc., Hagerstown, Md.
Pennsylvania Bridge Co., Beaver Falls, Iowa
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Riter-Conley Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.

STEEL SHEET PILING
*Wemlinger, Inc., New York

STEEL TOWERS, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Engr. Co., Cleveland, O.
*Ransome Conc. Machinery Co., Dunellen, N. J.

STOKERS, MECHANICAL
Babcock & Wilcox Co., New York
Combustion Engineering Corp., New York
Dayton Stoker Co., Dayton, Ohio
Detroit Stoker Co., Detroit
Green Eng. Co., East Chicago, Ind.
Sanford Riley Stoker Co., Worcester, Mass.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

STREET AND ROAD SIGNS (See Signs)

STREET BROOMS
Kendallville Broom & Brush Co., Kendallville, Ind.
Joseph Lay Co., Portland, Ind.
Osborn Mfg. Co., Cleveland, Ohio

STREET CLEANERS' CARTS
Durlach Can & Iron Works, Brooklyn, N. Y.
Rochester Can Co., Rochester, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.

STREET FLUSHERS AND SPRINKLERS
*Austin-Western Road Mchy. Co., Chicago
Austin Mfg. Co., Chicago
Autocar Co., Ardmore, Pa.
E. D. Etnyre & Co., Oregon, Ill
Federal Motor Truck Co., Detroit
Galion Iron Works & Mfg. Co. Galion, Ohio
General Motors Truck Co., Chicago
Heil Co., Milwaukee, Wis.
Charles Hvass & Co., New York
Kinney Mfg. Co., Boston
Mack Trucks, Inc., New York
Municipal Supply Co., South Bend, Ind.
White Co., Cleveland, Ohio
Whitehead & Kales Co., Detroit

STREET LIGHTING EQUIPMENT
*Novo Engine Co., Lansing, Mich.
American Conc. Marbelite Co., Forest Park, Ill.
J. B. Clow & Sons, Chicago
Electric Ry. Equipment Co., Cincinnati, Ohio
Holophane Co., New York
King Mfg. Co., Chicago
Line Material Co., So. Milwaukee, Wis.
J. S. Schofield's Sons Co., Macon, Ga.
Union Metal Mfg. Co., Canton, Ohio
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

STREET SIGNS (See Signs, Street)

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

KOEHRING Pull Shovel

NEW — exclusive — money earning features and principles make this the outstanding, advanced pull shovel!

Look at these Features:

1 Koehring boom shock absorber doing away with shocks and strains of side swiping dipper.

2 Jib frame that permits raising or lowering foot of boom, giving both greater digging depth and higher discharge clearance.

3 Dipper stick shock absorber — another protection against twisting and breakages and, through spring action on dipper teeth, gives gnawing, prying motion to cutting edge. Gets the full dipper load in tough digging.

4 Either bottom or inverted dipper dumping! Quick discharge!

5 Koehring Heavy Duty Construction.

• • •

Two Sizes—Three Models

¾ cu. yd. and 1¼ cu. yd. dipper capacities. LINE OF PLATE STRUCK MEASURE! Heap Loads 1¼ cu. yds. and 1½ cu. yds. Digging depths No. 301 — 17 to 20 ft.; No. 501 — 20 to 24 ft.; No. 601 — 20 to 24 ft. Write for special Koehring Pull Shovel circular.

Division of National Equipment Corporation

KOEHRING COMPANY MILWAUKEE, WISCONSIN

PAVERS, MIXERS—GASOLINE SHOVELS, PULL SHOVELS, CRANES AND DRAGLINES

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Where to Purchase

STREET SWEEPERS
*Austin-Western Road Mchy. Co., Chicago
Acme Road Machy. Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago
Butler Mfg. Co., Cleveland, Ohio
Elgin Sales Corp., New York
Kinney Mfg. Co., Boston
Whitehead & Kales Co., Detroit

STREET SWEEPER BROOMS REFILLED
Kendallville Broom & Brush Co., Kendallville, Ind.
Joseph Lay Co., Portland, Ind.
Osborn Mfg. Co., Cleveland, Ohio
Standard Brush & Broom Mfg. Co., Chicago

STUMP PULLERS
*Hoeke Bros., Inc., Seattle, Wash.
H. L. Bennett & Co., Westerville, Ohio
Ersted Mfg. Co., Portland, Ohio
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
John Waldron Corp., New Brunswick, N. J.

SUBGRADING MACHINES
*Blaw-Knox Co., Pittsburgh, Pa.
*Koehring Co., Milwaukee
*Lakewood Eng. Co., Cleveland, Ohio
Ted Carr & Co., Chicago
The Hug Co., Highland, Ill.
Shaw-Enochs Tractor Co., Minneapolis

SURFACERS & GRINDERS, CONCRETE
*Tousley Tool Co., Cleveland
Chicago Pneumatic Tool Co., New York
Cleveland Pneumatic Tool Co., Cleveland
Concrete Surfacing Machy. Co., Cincinnati
The Dallett Co., Philadelphia
Ingersoll-Rand Co., New York

SURVEYORS' INSTRUMENTS (See Instruments)

SWITCHBOARDS
*Allis-Chalmers Mfg. Co., Milwaukee
General Electric Co., Schenectady, N. Y.
Wagner Electric Mfg. Co., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TAMPERS, PNEUMATIC
*Independent Pneumatic Tool Co., Chicago, Ill.
Chicago Pneumatic Tool Co., New York
Ingersoll-Rand Co., New York

TAMPING MACHINES, CONCRETE BLOCK
Cement Block Machinery Co., Newark, N. J.
Zagelmeyer Cast Stone Block Mchy. Co., Bay City, Mich.

TANKS, AIR COMPRESSOR
*Connery & Co., Inc., Philadelphia
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Chicago Bridge & Iron Works, Chicago
Chicago Pneumatic Tool Co., New York
Curtis Pneu. Mchy. Co., St. Louis, Mo.
Graver Corp., East Chicago, Ind.
Heil Co., Milwaukee, Wis.
Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Nagle Engine & Boiler Works, Erie, Pa.
National Tube Co., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.
Westinghouse Tract. Brake Co., Wilmerding, Pa.
Worthington Pump & Mchy. Co., New York

TANKS, STEEL
*Columbian St. Tank Co., Kansas City, Mo.
*Connery & Co., Philadelphia
*Joseph Henhorst Co., Cincinnati, Ohio
Bauman Mfg. Co., Millersville, Pa.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
Butler Mfg. Co., Minneapolis, Minn.
J. I. Case Threshing Machine Co., Racine, Wis.
W. E. Caldwell Co., Louisville, Ky.
Canton Art Metal Co., Canton, Ohio
Chattanooga Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Dover Boiler Works, New York
Edwards Mfg. Co., Cincinnati, O.
Farrell Mfg. Co., Joliet, Ill.
O. C. Fouts Co., Middletown, Ohio
Graver Corp., E. Chicago, Ind.
R. Hardesty Mfg. Co., Denver, Colo.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Heil Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Nagle Eng. & Boiler Works, Erie, Pa.
New York Central Iron Works Co., Hagerstown, Md.
Pacific Tank & Pipe Co., San Francisco
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Riter-Conley Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh
United Iron Works, Inc., Kansas City, Mo.

TANKS, WOOD
W. E. Caldwell Co., Louisville, Ky.
G. M. Davis & Son, Palatka, Fla.
Eagle Tank Co., Chicago
Hauser-Stander Tank Co., Cincinnati, Ohio
Kalamazoo Tank & Silo Co., Kalamazoo, Mich.
National Tank & Pipe Co., Portland, Ore.
Pacific Tank & Pipe Co., San Francisco
Redwood Mfrs. Co., San Francisco
A. T. Stearns Lumber Co., Boston
U. S. Wind Eng. & Pump Co., Batavia, Ill.
Wendnagel & Co., Chicago

TAPES, STEEL AND METALLIC
Eugene Dietzgen Co., New York
Keuffel & Esser Co., Hoboken, N. J.
Lufkin Rule Co., Saginaw, Mich.
The L. S. Starrett Co., Athol, Mass.

TAR
*Barrett Co., New York
American Tar Products Co., Pittsburgh, Pa.

TAR KETTLES (See Kettles)

THAWING OUTFITS
*Chausse Oil Burner Co., Elkhart, Ind.
Asroil Burner Co., West New York, N. J.
Littleford Bros., Cincinnati
Hauck Mfg. Co., Brooklyn, N. Y.

TIES, STEEL
Carnegie Steel Co., Pittsburgh, Pa.
International Steel Tie Co., Cleveland, O.
Koppel Ind. Car & Equipment Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.

TIRES, RUBBER (For Motor Trucks)
Firestone Tire & Rubber Co., Akron, O.
Fisk Tire Co., Chicopee Falls, Mass.
Goodrich Rubber Co., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Kelly Springfield Tire Co., New York
U. S. Tire Co., New York

TOOL HOUSES, PORTABLE STEEL
*Blaw-Knox Co., Pittsburgh, Pa.
Littleford Bros., Cincinnati, Ohio

TORCHES, OIL HEATING
*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Co., Philadelphia, Pa.
Hauck Mfg. Co., Brooklyn, N. Y.
Hoosier Paint Works, Ft. Wayne, Ind.
Littleford Bros., Cincinnati
Mead-Morrison Mfg. Co., East Boston, Mass.
Alex Milburn Co., Baltimore, Md.
Sewall Paint & Varnish Co., Kansas City, Mo.
Sherwin-Williams Co., Cleveland, O.
Tropical Paint & Oil Co., Cleveland, O.
Truscon Laboratories, Detroit, Mich.

TORCHES, WARNING
*Toledo Pressed Steel Co., Toledo, Ohio
McCloskey Torch Co., Toledo, Ohio

TOWERS (See Standpipes and Elevated Tanks)

TRACKS, INDUSTRIAL AND PORTABLE
*Lakewood Eng. Co., Cleveland, O.
Atlas Car & Mfg. Co., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Foundry & Mfg. Co., Columbus, O.
Easton Car & Construction Co., Easton, Pa.
C. W. Hunt Co., Inc., W. N. Brighton, N. Y.
Koppel Ind. Car & Equipment Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.

TRACTION TREADS (See Treads, Traction)

TRACTORS
*Allis-Chalmers Mfg. Co., Milwaukee
*Atlas Engineering Co., Clintonville, Wis.
*Caterpillar Tractor Co., San Leandro, Calif.
*Cleveland Tractor Co., Cleveland, O.
*Huber Mfg. Co., Marion, O.
*International Harvester Co., Chicago
*John Lauson Co., New Holstein, Wis.
*W. A. Riddell Co., Bucyrus, O.
*Rogers Bros. Corp., Albion, Pa.
*United Tractors & Equipment Corp., Chicago
Advance-Rumely Thresher Co., Laporte, Ind.
Bates Mfg. Co., Joliet, Ill.
J. I. Case Threshing Machine Co., Racine, Wis.
Electric Wheel Co., Quincy, Ill.
Emerson-Brantingham, Rockford, Ill.
Hart-Parr Co., Charles City, Ia.
Lombard Tractor & Truck Corporation, N. Y.
Mack Trucks, Inc., New York
Mead-Morrison Mfg. Co., E. Boston
Minneapolis Steel & Mach. Co., Minneapolis
Shaw-Enochs Tractor Co., Minneapolis
Wehr Co., Milwaukee

TRACTOR HITCHES
*Gustav Schaefer Co., Cleveland
Trail-IT Co., St. Paul, Minn.
Whitehead & Kales Co., Detroit

TRAFFIC LINE MARKING MACHINES
Carrara Paint Co., Cleveland, O.
Continental Prod. Co., Euclid, O.
Line-O-Graph Co., N. Y.
Littleford Bros., Cincinnati, Ohio
Newaygo Engr. Co., Newaygo, Mich.

TRAFFIC PAINT
J. E. Bauer Co., Los Angeles, Cal.
Continental Prod. Co., Euclid, O.
E. I. du Pont de Nemours & Co., Wilmington, Del.
Hoosier Paint Wks., Ft. Wayne, Ind.
Hanline Bros., Baltimore, Md.
Tropical Paint & Oil Co., Cleveland, O.

TRAFFIC PLATES
Alan Wood Iron & Steel Co., Philadelphia
American Pressed Steel Co., Philadelphia
Central Iron & Steel Co., Harrisburg, Pa.

TRAFFIC SIGNAL EQUIPMENT
*Toledo Pressed Steel Co., Toledo, Ohio
Acme Traffic Signal Co., Chicago
Alumoyd Sign & Signal Co., Chicago
Amer. Gas Accumulator Co., Elizabeth, N. J.
Auto Sign Display Co. of Mo., St. Louis, Mo.
Cretney Traffic Guide Co., Madison, Wis.
Crouse-Hinds Co., Syracuse, N. Y.
Eagle Signal Sales Corp., Moline, Ill.
Esaco Mfg. Co., Peoria, Ill.
Evernu-Century Sign Co., Boston
Griswold Safety Signal Co., Minneapolis
Horni Signal Mfg. Corporation, Newark, N. J.
Line Material Co., South Milwaukee, Wis.
Little Giant Co., Mankato, Minn.
Lyle-Signs, Minneapolis, Minn.
Rochester Street Signal Co., Rochester, N. Y.
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
Traffic Equipment Corp., N. Y.
Union Iron Prod. Co., E. Chicago, Ind.
Welsbach Traffic Signal Co., Philadelphia

TRAILERS FOR TRUCKS AND TRACTORS
*Electric Wheel Co., Quincy, Ill.
*Euclid Crane & Hoist Co., Euclid, O.
*Highway Trailer Co., Edgerton, Wis.
*Rogers Bros. Corporation, Albion, Pa.
*Gustav Schaefer Co., Cleveland
Arcadia Trailer Corporation, Newark, N. J.
Detroit Trailer & Mach. Co., Detroit
Eagle Wagon Works, Auburn, N. Y.
Easton Car & Construction Co., Easton, Pa.
Fruehauf Trailer Co., Detroit, Mich.
Hercules Trailer Mfg. Co., Los Angeles
Imperial Mach. Co., Minneapolis
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Lee Trailer & Body Co., Chicago
Little Red Wagon Mfg. Co., Omaha
Miami Trailer-Scraper Co., Troy, O.
Muskogee Iron Wks., Muskogee, Okla.
Smith Trailer Corp., Syracuse, N. Y.
Trailmobile Co., Cincinnati
Troy Trailer & Wagon Co., Troy, O.
Warner Mfg. Co., Beloit, Wis.
Whitehead & Kales Co., Detroit

TRAILERS, HEAVY MACHINERY
*Highway Trailer Co., Edgerton, Wis.
*Rogers Bros. Corporation, Albion, Pa.

TRAILERS, INDUSTRIAL
*Electric Wheel Co., Quincy, Ill.
*Highway Trailer Co., Edgerton, Wis.
*Lakewood Eng. Co., Cleveland, O.
*Rogers Bros. Corporation, Albion, Pa.
*Gustav Schaefer Co., Cleveland
Chase Fdry. & Mfg. Co., Columbus, O.
Clark Tructractor Co., Battle Creek, Mich.
Detroit Trailer & Machinery Co., Detroit
Easton Car & Construction Co., Easton, Pa.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Lee Trailer & Body Co., Plymouth, Ind.
Miami Trailer-Scraper Co., Troy, O.
Trailmobile Co., Cincinnati
Whitehead & Kales Co., Detroit

TRAILER COUPLINGS
*Gustav Schaefer Co., Cleveland
Trail-IT Co., St. Paul, Minn.

TRAMWAYS, AERIAL WIRE ROPE (See Aerial Wire Rope Tramways)

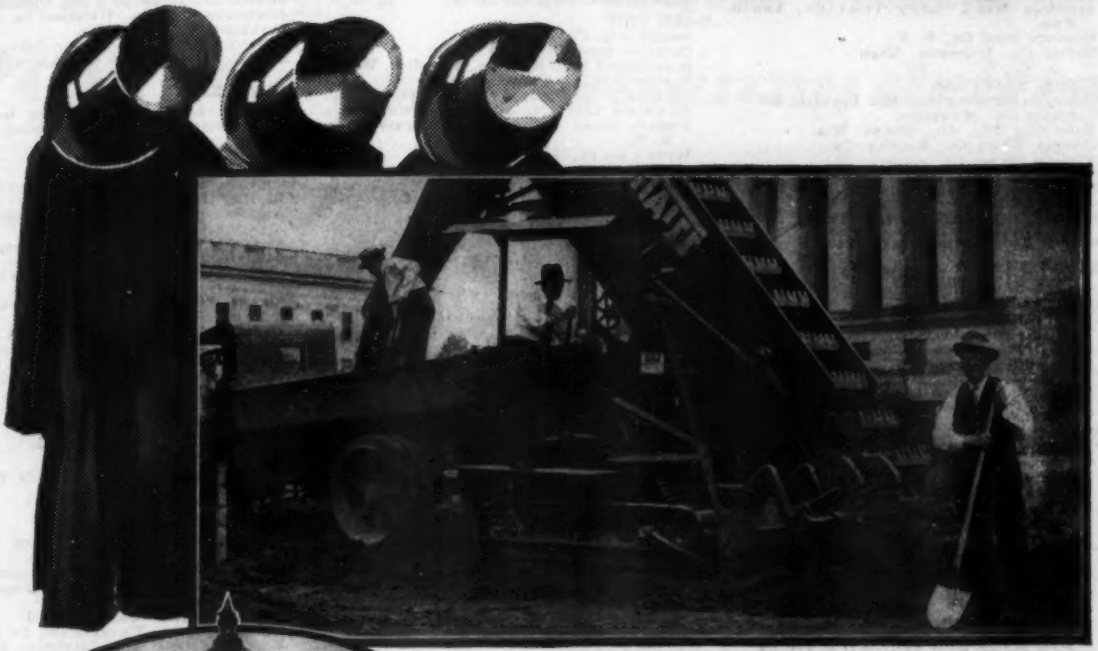
TRANSFORMERS
*Allis-Chalmers Mfg. Co., Milwaukee
Duncan Elec. Mfg. Co., Lafayette, Ind.
Enterprise Elec. Co., Warren, O.
General Elec. Co., Schenectady, N. Y.
Kuhlman Elec. Co., Bay City, Mich.
Maloney Electric Co., St. Louis, Mo.
Packard Electric Co., Warren, O.
Pittsburgh Trans. Co., Pittsburgh, Pa.
Wagner Elec. Corp., St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

TRANSITS AND LEVELS (See Instruments)

TRANSMISSION MACHINERY, POWER
*Allis-Chalmers Mfg. Co., Milwaukee
Chain Belt Co., Milwaukee
Dodge Mfg. Corpn., Mishawaka, Ind.
Kent Machine Co., Kent, O.
Link-Belt Co., Chicago
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

** Indicates that the manufacturer carries an advertisement. See index facing inside back cover.**

Silk Hats Hang High



. . . when the Governor of the State of Washington, his State Auditor and Land Commissioner pitch in with a Haiss Excavator to improve the Capitol Grounds.

The State Capitol at Olympia, Wash., and (above) a close-up of the grading operation.

On the operator's platform — Hon. Roland H. Hartley, Governor.

Trimming in the truck—Clark V. Savage, State Land Comm.

In the right foreground — C. W. Clausen, State Auditor.

. . . and they'll do a lot of work in a very short time! For shallow grading the Haiss Excavator will out-work equipment costing twice as much. It makes a cut 8 feet wide, is a continuous digging machine (no stop for turntable swing) will handle anything up to gumbo without plowing. Machines have given a practical demonstration on all kinds of work in nearly every part of the country. You can make money with a Haiss Excavator. *Let us send you our "Excavator Performance Bulletin".*

HAISS EXCAVATOR

GEORGE HAISS MANUFACTURING CO., INC.
142nd STREET and PARK AVE. NEW YORK, N. Y.
Representatives in Principal Cities

Where to Purchase

TRASH CANS (See Cans)

TREADS, SAFETY
*Slaw-Knox Company, Pittsburgh, Pa.
American Abrasive Metals Co., N. Y.
American Mason Safety Tread Co., Lowell, Mass.
Concrete Steel Co., N. Y.
Norton Co., Worcester, Mass.

TREADS, TRACTION
*Caterpillar Tractor Co., San Leandro, Cal.
*Trackson Co., Milwaukee
Belle City Mfg. Co., Racine, Wis.
Creeper Wheel Co., Reading, Pa.
Electric Wheel Co., Quincy, Ill.
Tractor Grip Wheel Co., Toledo, O.
Whitehead & Kales Co., Detroit

TRENCH EXCAVATORS (See Excavators)

TRENCH PUMPS (See Pumps, Contractors')

TRUCKS, TANK & SPRINKLER (See Wagons, Tank & Sprinkler)

TURBINES
Allis-Chalmers Mfg. Co., Milwaukee
De Laval Steam Turbine Co., Trenton, N. J.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., N. Y.
Terry Steam Turbine Co., Hartford, Conn.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

TURNTABLES FOR MOTOR TRUCKS
*Slaw-Knox Co., Pittsburgh, Pa.
Champion Engine Co., Kenton, O.
Easton Car & Construction Co., Easton, Pa.
Freeman Mfg. Co., Racine, Wis.
Hug Co., Highland, Ill.
Western Structural Co., Moline, Ill.

VALVES, CHECK
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston
Ludlow Valve Mfg. Co., Troy, N. Y.
Mich. Valve & Foundry Co., Detroit
Rensselaer Valve Co., Troy, N. Y.

VALVES, GATE AND INDICATOR POSTS
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston
Columbian Iron Works, Chattanooga, Tenn.
Crane Company, Chicago
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve Co., Waterford, N. Y.
Iowa Valve Co., Oskaloosa, Ia.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Troy, N. Y.
Michigan Valve & Fdry. Co., Detroit
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., E. Orange, N. J.
Waterous Co., St. Paul
R. D. Wood & Co., Philadelphia

VALVES FOR GASOLINE ENGINES
*Industrial Engine Parts Co., Inc., Cleveland

VALVES, RELIEF
*Neptune Meter Co., New York

VALVES, TAPPING
Eddy Valve Co., Waterford, N. Y.
Hays Mfg. Co., Erie, Pa.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Co., Troy, N. Y.
Michigan Valve & Foundry Co., Detroit
Rensselaer Valve Co., Troy, N. Y.
Waterous Co., St. Paul
A. P. Smith Mfg. Co., E. Orange, N. J.

VALVE BOXES AND HOUSINGS
*Central Foundry Co., N. Y.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
H. W. Clark Co., Mattoon, Ill.
J. B. Clow & Sons, Chicago
Columbian Iron Works, Chattanooga, Tenn.
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve Co., Waterford, N. Y.
Iowa Valve Co., Oskaloosa, Ia.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Troy, N. Y.
Mueller Co., Decatur, Ill.
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., E. Orange, N. J.
Waterous Co., St. Paul
R. D. Wood & Co., Philadelphia

VOTING EQUIPMENT FOR CITIES
Automatic Registering Machine Co., Jamestown, N. Y.
Ideal Voting Booth Co., Sullivan, Ind.
Douglas Manufacturing Co., Crete, Nebr.
Pennsylvania Construction Co., Marietta, Pa.
Korff Manufacturing Co., Lansing, Mich.
Van Dorn Iron Works Co., Cleveland, O.

WAGONS (See Dump Carts and Wagons)

WAGON BODIES (See Dump Bodies)

WAGON LOADERS (See Loaders, Gravel)

WAGONS & TRUCKS, TANK & SPRINKLER
*Joseph Honhorst Co., Cincinnati, O.
Acme Road Machinery Co., Frankfort, N. Y.
Butler Mfg. Co., Minneapolis, Minn.
J. I. Case Threshing Machine Co., Racine
Galion Iron Works & Mfg. Co., Galion, Ohio
Heil Co., Milwaukee, Wis.
Mack Trucks, Inc., New York

WALL TIES
Berger Mfg. Co., Canton, O.
Concrete Steel Co., N. Y.
Consolidated Exp. Metal Co., Wheeling, W. Va.
Hawley Mfg. Co., Chicago
M. & M. Wire Clamp Co., Minneapolis
Milwaukee Corr. Co., Milwaukee, Wis.
Niagara Metal Stamp Corp., Niagara Falls, N. Y.
Wedgit Tie Co., Inc., New York

WASHERS, SAND AND GRAVEL
*Allis-Chalmers Mfg. Co., Milwaukee
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago
Smith Engineering Works, Milwaukee
Stephens-Adamson Mfg. Co., Aurora, Ill.

WATCHES, STOP
Sterling Stop Watch Co., New York

WATER MAIN TAPPING MACHINES
Glauber Brass Mfg. Co., Cleveland
Hays Mfg. Co., Erie, Pa.
Mueller Co., Decatur, Ill.
A. P. Smith Mfg. Co., E. Orange, N. J.

WATER METERS (See Meters, Water)

WATERPROOFING COMPOUNDS AND MATERIALS
*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Company, N. Y.
*Philip Carey Co., Cincinnati, O.
*Standard Oil Co. (Indiana), Chicago
Anti-Hydro Waterproofing Co., Newark, N. J.
Atlantic Refining & Asphalt Corp., Philadelphia
Euclid Chemical Co., Cleveland
Genfire Steel Co., Youngstown, O.
Master Builders Co., Cleveland, O.
Minwax Co., N. Y.
Ruberoid Co., N. Y.
Sandusky Cement Co., Cleveland, O.
Sonneborn Sons, Inc., N. Y.
Texas Company, N. Y.
Toch Brothers, N. Y.
Truscon Laboratories, Detroit, Mich.

WATER PURIFICATION (See also Filters)
*Wallace & Tiernan Co., Inc., Newark, N. J.
Cochrane Corp., Philadelphia
Paradon Mfg. Co., Arlington, N. J.
R. U. V. Co., N. Y.

WATER PURIFICATION CHEMICALS
Arnold Hoffman & Co., Inc., N. Y.
E. I. du Pont de Nemours & Co., Wilmington, Del.
Electro Bleaching Gas Co., N. Y.
General Chemical Co., N. Y.
Hooker Electrochemical Co., N. Y.
Mathieson Alkali Works, Inc., N. Y.
Pennsylvania Salt Mfg. Co., Philadelphia

WATER SOFTENERS
American Water Softener Co., Philadelphia
Cochrane Corp., Philadelphia
Graver Corp., E. Chicago, Ind.
International Filter Co., Chicago
Permutit Co., N. Y.
W. B. Scaife & Sons, Pittsburgh, Pa.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

WATER WASTE DETECTION
Empire Electric & Water Co., Inc., N. Y.
Pitometer Co., N. Y.
Simplex Valve & Meter Co., Philadelphia

WATER WHEELS
*Allis-Chalmers Mfg. Co., Milwaukee
J. Leffel & Co., Springfield, O.
I. P. Morris and De La Vergne, Inc., Hydr. Div., Philadelphia
Newport News Shipbuilding & Dry Dock Co., Newport News, Va.
Pelton Water Wheel Co., San Francisco
S. Morgan Smith Co., York, Pa.
Worthington Pump & Machinery Corp., N. Y.

WATER WORKS PUMPS (See Pumps)

WEIGHING MACHINES
*Conveying Weigher Co., N. Y.

WELDING APPARATUS
*Alex. Milburn Co., Baltimore, Md.
*Oxweld Acetylene Co., L. I. City, N. Y.
Burke Electric Co., Erie, Pa.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland, O.
Macleod Co., Cincinnati, O.
Smith's Inventions, Inc., Minneapolis, Minn.
U. S. Light & Heat Corp., Niagara Falls
Westinghouse Electric & Mfg. Co., E. Pittsburg, Pa.
Wilson Welder & Metals Co., Inc., Hoboken, N. J.

WELLS, CONCRETE
Kelly Well Co., Grand Island, Neb.

WELLS, GRAVEL WALL
Layne & Bowler, Inc., Memphis, Tenn.

WELL-DRILLING AND BLAST HOLE MACHINES
*The Burch Corp., Crestline, Ohio
*Loomis Machine Co., Tiffin, O.
*Sanderson Cyclone Drill Co., Orrville, O.
Armstrong Mfg. Co., Waterloo, Ia.
Burkhardt Co., Kiel, Wis.
Keystone Driller Co., Beaver Falls, Pa.
Star Drilling Machine Co., Akron, O.

WELL SCREENS
A. D. Cook, Inc., Lawrenceburg, Ind.
E. E. Johnson, Inc., St. Paul, Minn.

WHEELBARROWS
*General Wheelbarrow Co., Cleveland, O.
*Lansing Co., Lansing, Mich.
Asheboro Wheelbarrow Co., Asheboro, No. Carolina
American Steel Scraper Co., Sidney, Ohio
Case Crane & Engg. Co., Columbus, Ohio
Chattanooga Wheelbarrow Co., Chattanooga, Tenn.
Cleveland Wheelbarrow Co., Cleveland, O.
Fairbanks Co., N. Y.
Jackson Mfg. Co., Harrisburg, Pa.
Puffer-Hubbard Mfg. Co., Minneapolis
Sidney Steel Scraper Co., Sidney, O.
Sterling Wheelbarrow Co., Milwaukee
Toledo Wheelbarrow Co., Toledo, O.

WHEELS FOR ALL USES
*Electric Wheel Co., Quincy, Ill.

WHEELS, CRAWLER TYPE FOR WAGONS
*Creeper Wheel Co., Reading, Pa.

WINCHES
*Beebe Bros., Inc., Seattle, Wash.
*Brown Clutch Co., Sandusky, O.
*Clyde Iron Works Sales Co., Duluth, Minn.
*Dobbie Foundry & Mach. Co., Niagara Falls
*Mundy Sales Corp., N. Y.
*Gustav Schaefer Co., Cleveland
Advance-Rumely Thresher Co., La Porte, Ind.
Bethlehem Steel Co., Bethlehem, Pa.
Chisholm-Moore Mfg. Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Ersted Mfg. Co., Portland, Ore.
John T. Horton Co., New York
Ingersoll-Rand Co., New York
Lidgerwood Mfg. Co., Elizabeth, N. J.
Mead-Morrison Mfg. Co., E. Boston
Muskogee Iron Wks., Muskogee, Okla.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Street Bros. Mach. Works, Chattanooga

WINDOW FRAMES AND SASH (Metallic)
*Truscon Steel Co., Youngstown, O.
Wm. Bayley Co., Springfield, O.
Detroit Steel Prod. Co., Detroit
E. D. Frederick Co., Holyoke, Mass.
Genfire Steel Co., Youngstown, O.
David Lupton's Sons Co., Philadelphia
Penn Metal Co., Boston
Sykes Co., Chicago

WIRE AND CABLE
*American Steel & Wire Co., Chicago
*Williamsport Wire Rope Co., Williamsport, Pa.
American Cable Co., N. Y.
Copperweld Steel Co., Glassport, Pa.
Fischer & Hayes Rope & Steel Co., Chicago
General Electric Co., Schenectady, N. Y.
Habirshaw Cable & Wire Corp., N. Y.
Hazard Wire Rope Co., Wilkesbarre, Pa.
Mac Whyte Co., Kenosha, Wis.
Marion Insulated Wire & Rubber Co., Chicago
National India Rubber Co., Bristol, R. I.
New York Insulated Wire Co., N. Y.
Okonite Co., Passaic, N. J.
John A. Roebling's Sons Co., Trenton, N. J.
Safety Cable Co., N. Y.
Simplex Wire & Cable Co., Boston
Standard Underground Cable Co., Pittsburgh Pa.
Tubular Woven Fabric Co., Pawtucket, R. I.

WIRE MESH REINFORCEMENT
*American Steel & Wire Co., Chicago
*Truscon Steel Co., Youngstown, O.
National Steel Fabric Co., Pittsburgh, Pa.
Wickwire-Spencer Steel Co., N. Y.

WIRE ROPE FITTINGS
*L. P. Green, Chicago
John A. Roebling's Son Co., Trenton, N. J.

WIRE ROPE (See Rope, Wire)

WOOD BLOCKS (See Paving Blocks)

WOODWORKING MACHINES
*American Saw Mill Machinery Co., Hackettstown, N. J.
*C. H. & E. Mfg. Co., Milwaukee, Wis.
R. L. Carter Co., Phoenix, N. Y.
Jaeger Portable Power Corp., Detroit
Jones Superior Machine Co., Chicago
Master Woodworker Mfg. Co., Detroit

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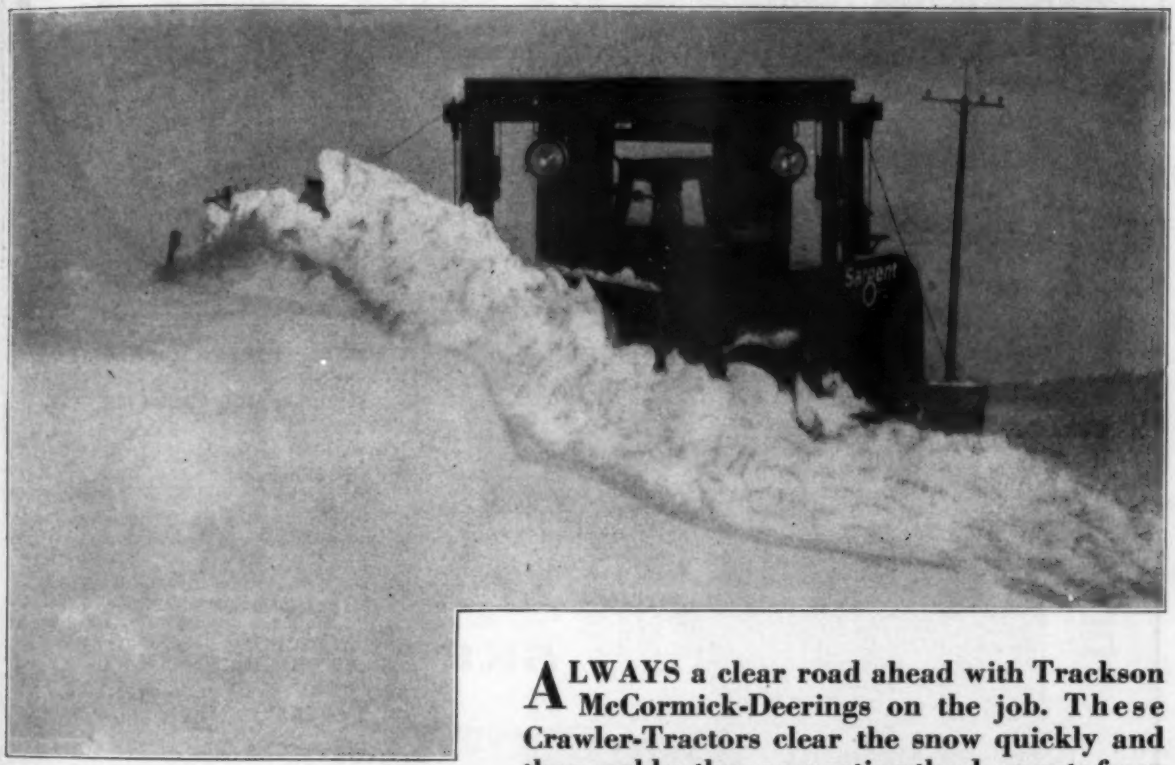
SPEED - *for the light falls*
POWER - *for the heavy drifts*



MODEL LH

ALWAYS a clear road ahead with Trackson McCormick-Deerings on the job. These Crawler-Tractors clear the snow quickly and thoroughly, thus preventing the deep ruts from traffic which later cause thousands of dollars in road repair. Their speed and power meet the most rigid requirements of snow removal. Their low first cost and low operating cost meet the most conservative community budgets. Their fewer parts and sturdy construction assure long service and least upkeep. When winter is over they supply the sure-footed power needed for road building and maintenance. See or write your nearest Trackson dealer for complete information today.

Trackson Company

FULL-CRAWLERS & TRACTOR EQUIPMENT

519 CLINTON ST. MILWAUKEE, WIS.

FULL CRAWLERS ♦ BULLDOZERS ♦ LOADERS ♦ SHOVELS ♦ CRANES

Good Roads MACHINERY

Did you read that article on page 40 July 17th. issue of Pit and Quarry "Temporary crushed Stone plant supplements in a road construction job." Here's a piece of it.

...their vacations visiting Fort Ticonderoga, ...Lake Champ... ...erless motorists who spent ...last summer, to the ...rown Point, and other places of historic interest in this beautiful country. The job was too far removed from any area of sufficient population density or industrial activity to be within the service range of commercial producers of crushed stone. Consequently—as has become more and more customary in the extension of first-class roads through sparsely settled regions—it was necessary for the contractor to operate a crushed-stone plant of his own, as a sort of side issue. In this case not even electrical power was available. This contracting firm, J. W. ... was fortunate in locat...

Road Contractors quite often face a similar problem to that referred to by the above article, and in such cases a Portable Rock Crushing Plant will effect a great saving in time and labor.

TO MEET PRESENT SPECIFICATIONS, FOR STONE 1¼" AND UNDER IN SUFFICIENT CAPACITY, INVESTIGATE

Good Roads CHAMPION Roller Bearing REDUCTION CRUSHERS on Portable Mountings with Folding Type Bucket Elevators, complete.

The Storage Bins (in various capacity) with Screens mounted thereon, forms the second portable unit and completes the plant.

SKF SELF-ALIGNING ROLLER BEARINGS

CRUSHER SIZES AND CAPACITIES

No.	Opening	Appx. Cap.	Jaws set to
1020	10" x 20"	¾" T.P.H. 10	1½" T.P.H. 20
1030	10" x 28½"	¾" T.P.H. 15	1½" T.P.H. 30
1040	10" x 40"	¾" T.P.H. 20	1½" T.P.H. 45

ALEMITE LUBRICATION FITTINGS

THE GOOD ROADS MACHINERY CO.

INCORPORATED

"A business established and in continuous operation for fifty-one years at Kennett Square—in Pennsylvania."

Branches

Philadelphia Pittsburgh Watertown, Mass. New York Chicago

"PERFORMANCE *is the* BETTER PART *of* VALUE"

IF YOU knew nothing about the Half-Yard Insley but its design and quality you would want to see it.

—If, in addition to that, you knew the selling price, you would want one when you needed a new machine.

—But if you really knew what a Half-Yard Insley would do—the performance of which it is capable you would ***have*** one right now—and two or three more would follow as your work permitted.

It takes a lot of work to keep an Insley busy—it is fast—and though it is a half-yard machine it looks bigger when the yardage is figured.

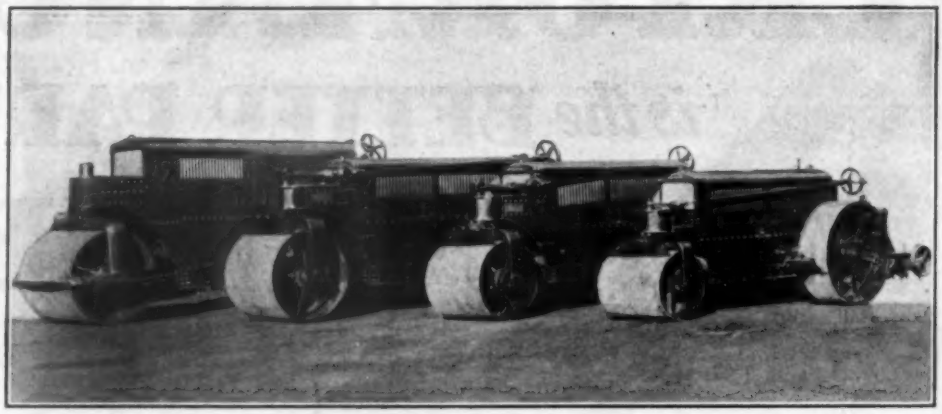
It isn't "speed" alone that makes the Half-Yard Insley pay—it's speed plus sturdy construction and frictionless design that eliminates maintenance expense, and assures you the full profit on every job it does.

INSLEY MANUFACTURING COMPANY
INDIANAPOLIS, INDIANA
Division of National Equipment Corp.

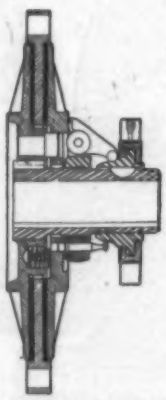
INSLEY

INSLEY NEC

732



Twin Disc Clutches Help



PARTS STATIONS

Boston, Mass.—Rapp-Huckins Co. Inc., 59 Haverhill St.
Buffalo, N. Y.—Edward W. Rode, 45 A. St.
Cleveland—Industrial Engine Parts, Inc., 1053 E. 61st St.
Chicago—Motive Parts Co. of America, Inc., 2419 Indiana Ave.
Des Moines—Motive Parts Co. of America, Inc., 1204 W. Grand Ave.
Detroit—Whitney Brothers, 6464 Epworth Blvd.
Fort Worth, Tex.—Fort Worth Wheel & Rim Co., 312 Throckmorton St.
Houston, Tex.—Portable Rig Co., Inc.
Los Angeles—Coast Machinery Corporation, 406 E. Third St.
New York City—John Reiner & Company, Inc., 309 Church St.
Philadelphia, Pa.—Maerky Machine Works, 240 Cherry St.
Pittsburgh, Pa.—Motive Parts Co. of Pa., 6314 Penn. Ave.
Raleigh N. C.—Motor & Equipment Co., 215 E. Davie St.
San Francisco—F. Somers Peterson Co., 57 California St.
Tulsa, Okla.—Buda Engine Service Co. of Tulsa, Inc.

AMONG other features essential to the efficient operation of road rollers, the Buffalo-Springfield Roller Company advertises two special advantages:

1. **Reverse of travel direction without changing gears.**
2. **Smooth reverse at all times, highly important in the rolling of hot-laid pavements.**

Twin Disc Clutches help to give Buffalo-Springfield road rollers these advantages. Two clutches are used, one for forward travel, the other for reverse, both operated by one convenient lever.

Smooth engagement, ample load carrying capacity, ease of adjustment and unfailing dependability are the Twin Disc qualities depended upon to give every Buffalo-Springfield roller these important advantages.

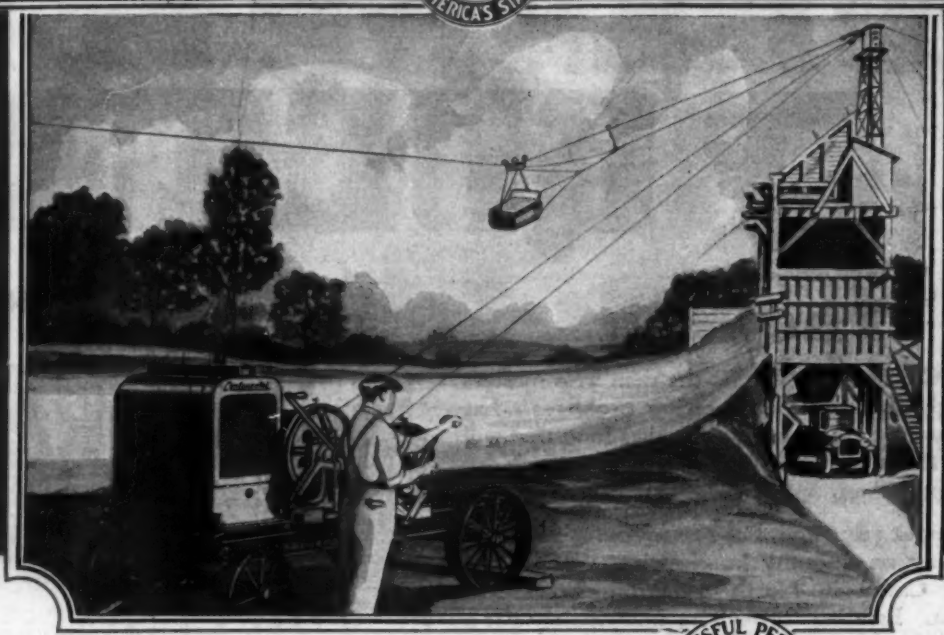
These qualities are built into nearly 500 styles and sizes of Twin Disc clutches. Among them is probably just the clutch you need. We will gladly send full information about any clutch installation. Write.

TWIN DISC CLUTCHES

TWIN DISC CLUTCH COMPANY
RACINE WISCONSIN

Dependable Power for Every Purpose

CONTINENTAL MOTORS — AMERICA'S STANDARD

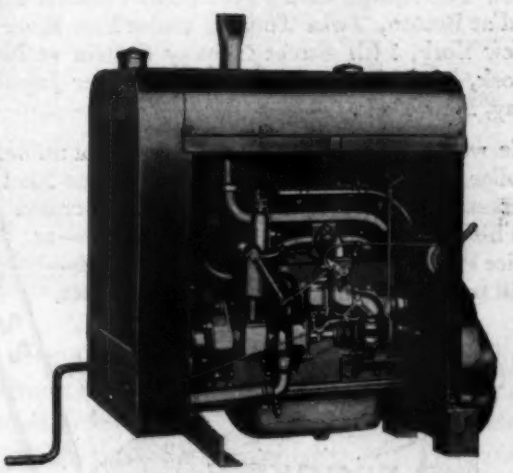


FOR SUCCESSFUL PERFORMANCE — A.G.C.-A.

More Economies —Greater Profits

The Continental powered Sauerman Portable Scrapers, are daily proving the good judgment of hundreds of contractors who use them as standard equipment in excavating work.

In this field where power, ruggedness, long life, and economy of operation are a determining factor in the difference between profit and loss, Continental Heavy Duty Engines furnish the answer to the question of greater profits.



CONTINENTAL MOTORS CORPORATION
INDUSTRIAL EQUIPMENT DIVISION
Office and Factory: Muskegon, Michigan
The Largest Exclusive Motor Manufacturer in the World

Continental Engines

Please mention the CONTRACTORS AND ENGINEERS MONTHLY—it helps.

PURE WATER & QUEENS

The Men

PATRICK McGOVERN—the man who masters seemingly impossible engineering problems—has started on a tunnel twenty-two miles long that will double the supply of pure water for New York City's six million.

Thirty-eight years ago, Pat McGovern—a brawny lad having an uncanny knack with a pick—left County Cavan in North Ireland and came to America. Landing 'broke' he immediately got a job as a day laborer at $1.75 a day. He has been working ever since, and has just recently won the contract for his latest big job—a forty-two million dollar project.

AND

JOHN S. MACDONALD, youngest chief engineer and tunnel specialist, was engineer on the New York Barge Canal, Fort Point Channel Tunnel at Boston, Twin Tunnels under East River at New York, 14th Street Subway System at New York, and the Causeway Bridge over Jamaica Bay, New York.

He was chief engineer on the twenty-six million dollar subway section in Philadelphia, the 53rd Street Tunnel in New York, and now as a crown to his many engineering monuments, he—as Vice President of the McGovern interests—will be chief engineer on this huge project.

The Job

A tunnel twenty-two miles long, seventeen feet inside diameter, and eight hundred feet deep through solid rock to carry enough pure Catskill water from Yonkers to Brooklyn to double the supply throughout New York City and to insure its continuous flow—a forty-two million dollar project.

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Nineteen shafts varying in depth from five to eight hundred feet will be sunk. Three thousand men will be lowered down the shafts daily to bore this underground river.

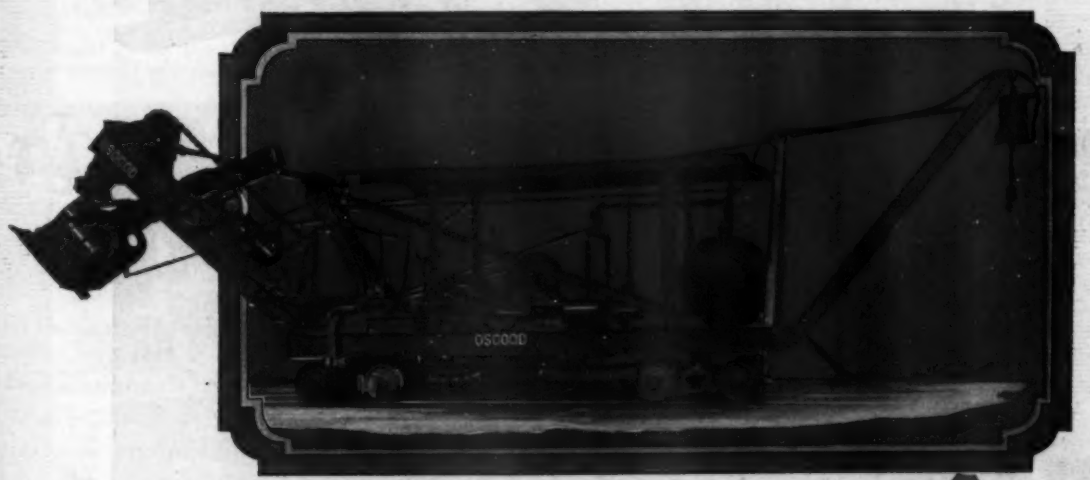
22 MILES

for BROOKLYN BOROUGH

The Tool

Faced with the need for a shovel heavy enough to do rock excavating yet work within the tunnel diameter of nineteen feet, it remained for engineers of the Osgood Company, Marion, Ohio, with more than a half century of continuous experience in the design and construction of excavating machinery, to develop the shovel that met the exacting requirements of Mr. McGovern.

A standard Osgood 43, railroad type shovel, which had proven its



ability on tunnel work under severe conditions, was adapted for work on this project by equipping it with a special low A-frame, an armored boom and dipper handle, and a two-piece rock type dipper with manganese steel front which was especially designed to meet the approval of McGovern's engineers. Each shovel is equipped with a jib crane and air hoist for transferring empties from the incoming track to the loading track, making it possible to take a loaded car from the shovel in less than twenty seconds.

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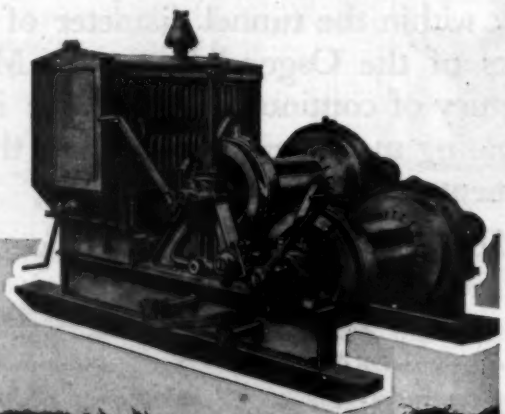

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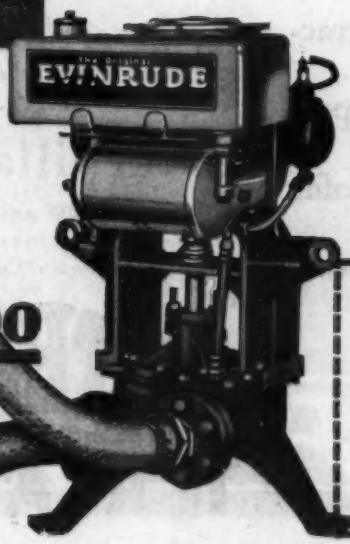
30	9480	2400
35	8280	2450
40	7140	2500
45	6000	2600
50	4800	2650
55	3360	2700



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TRACTOR

MONONGALIA COUNTY (West Va.) uses this ½ yd. Universal 35 to remove road slides and slips. Notice how far reach of the shovel boom permits casting on the far side of the road.

UNIVERSAL 35 owned by William Muirhead, Durham, N. C., unloading 900 tons of steel forms, girder and beams in ten hours.

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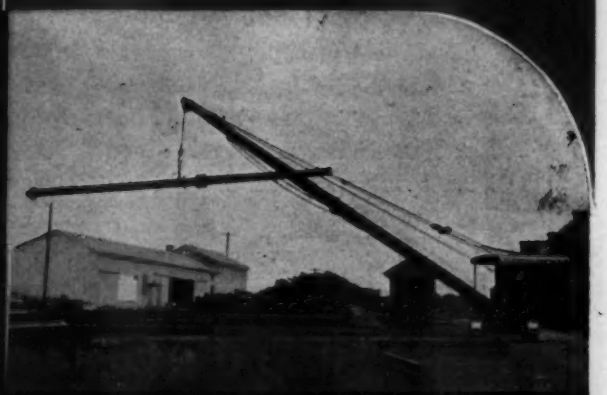

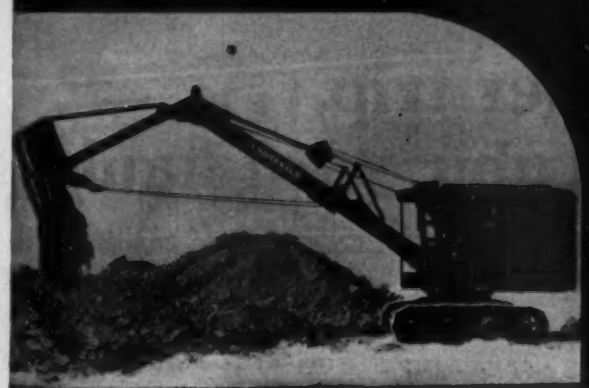

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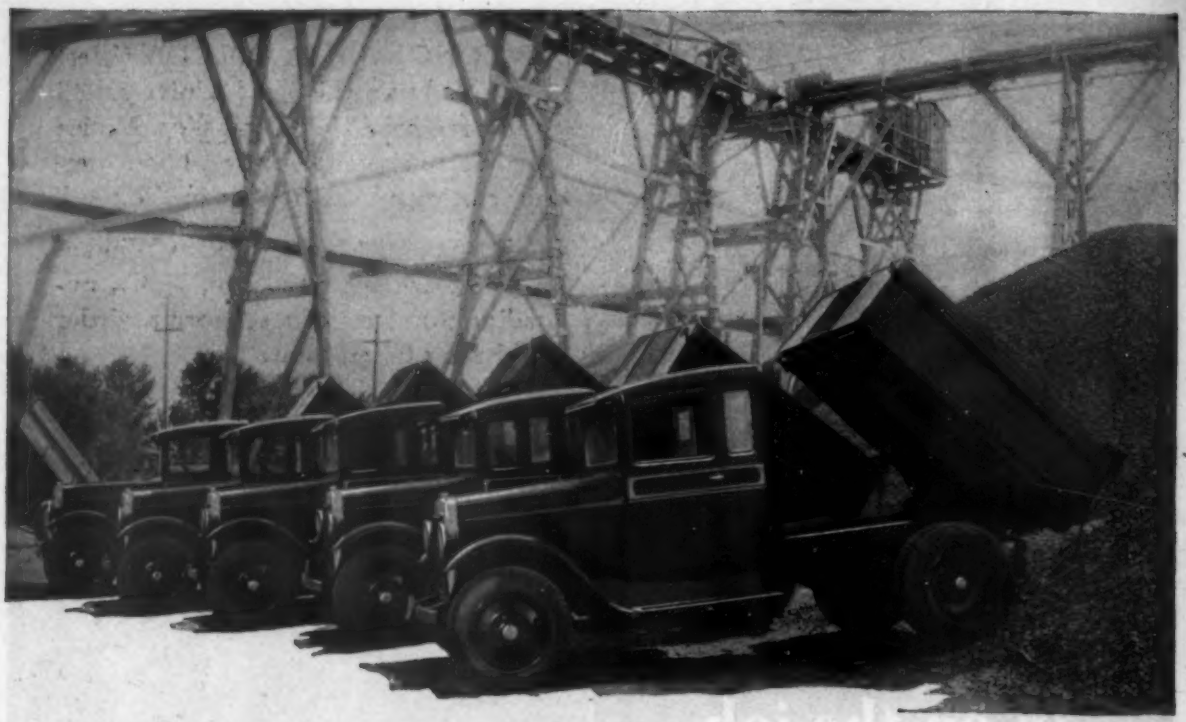

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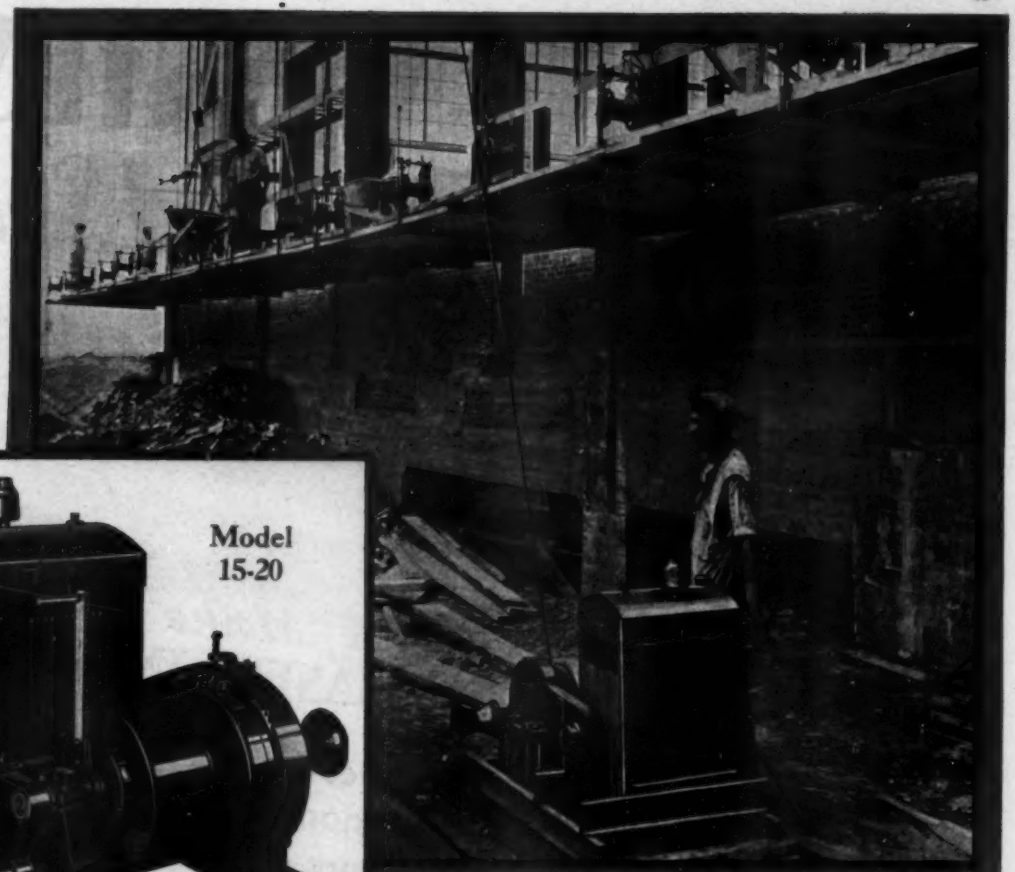

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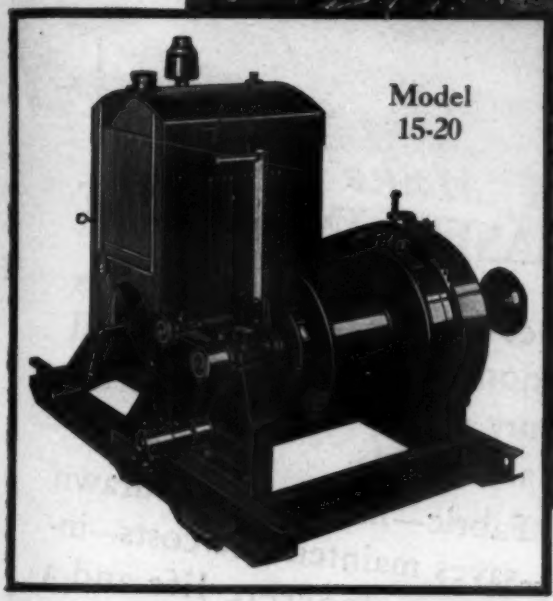

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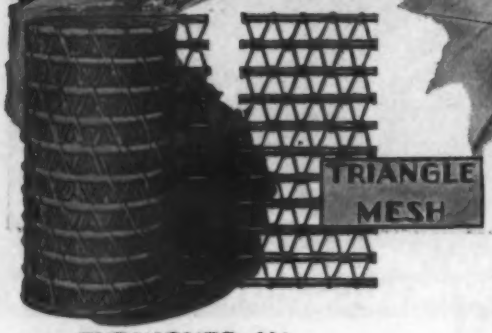

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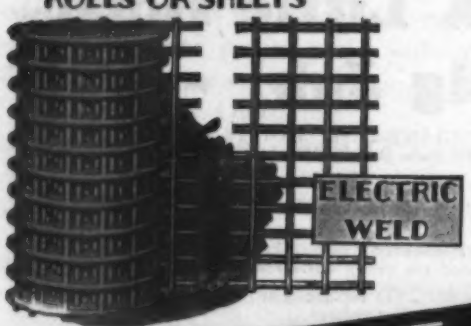

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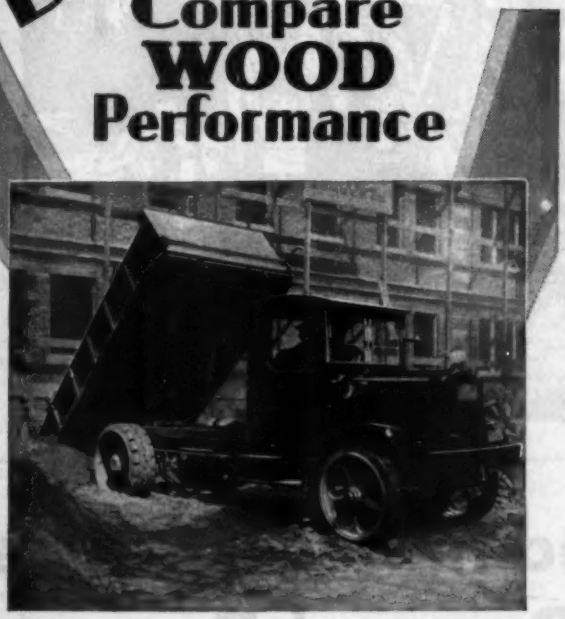

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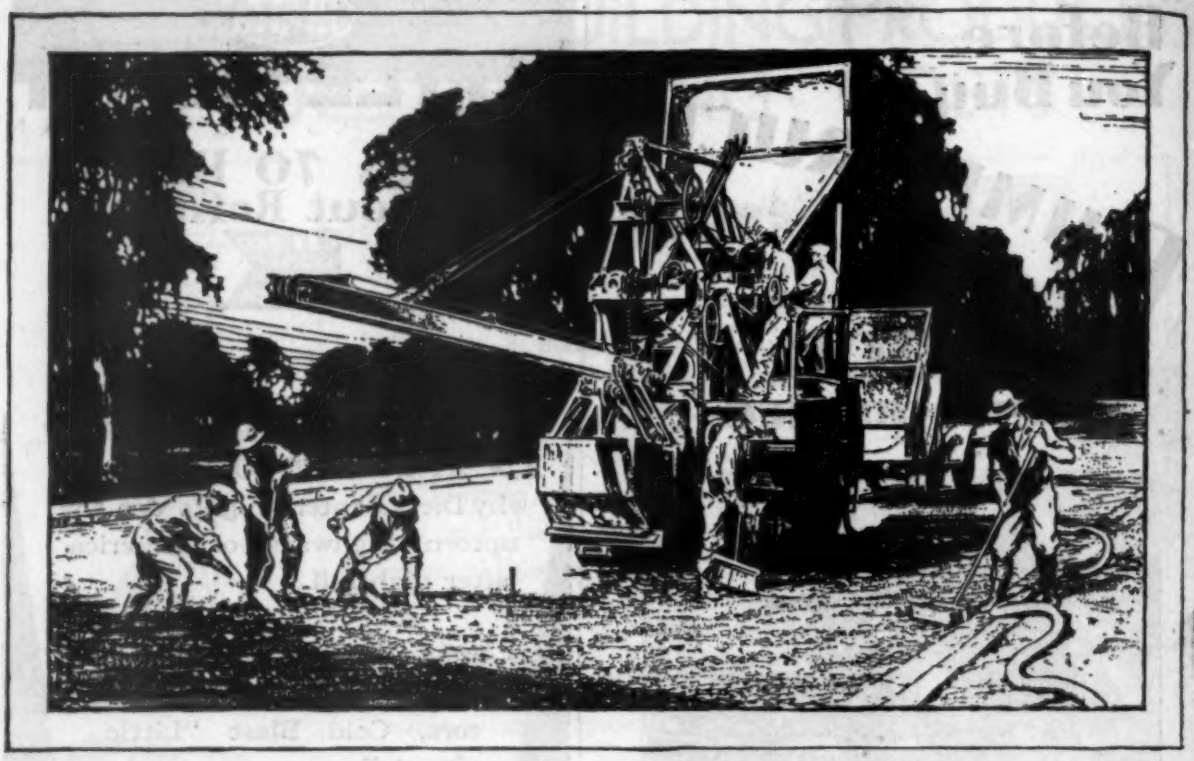

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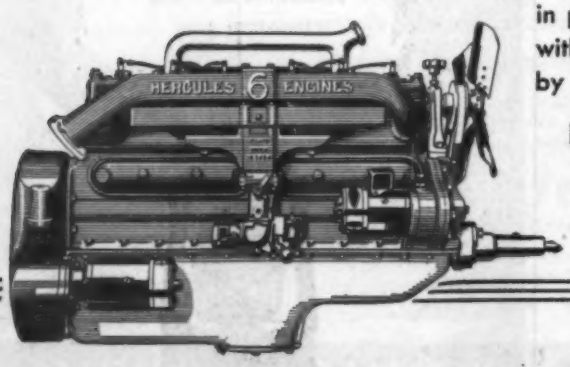

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1929

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Table of Contents

Book Review
Fireproofing Structural Steel 86

Bridge Construction
Paving the Slope of a Sand-Fill Bridge Approach..... 69

Building Construction
Extensive Construction for the New Refinery at East Chicago, Ind. 59
Material Handling on the New Dominion Square Building in Montreal 63
Handling Concrete on a Building for Handling Criminals 84

Costs
Are You Kidding Yourself About Your Used Equipment? 57

Drainage
Overhead Drain Prevents Flood of Excavation..... 80

Dredging
Contractor Saves $20,000 in Eight Months with Diesel Dredge 60

Equipment and Materials
Conveyors
A New Material Loader..... 100
Dirt Movers
An Automatic Hydraulic Tractor Scraper..... 106
Form Ties and Scrapers
A Concrete Tie and Spacer with Detachable Head.. 104
Hoists and Winches
Boom Swinger for Steel Erection and Material Handling 96
A New Tractor Power Winch and Bulldozer..... 98
A Hoist for Use with Tractors..... 104
Miscellaneous
A Light Weight Puller-Jack..... 100
An Improved Pavement Tester..... 102
A New Type of Portable Chlorinator..... 106
Power Plants
Portable Light and Power Plants..... 98
Road Machinery
An 8-Foot Grader with Telescopic Rear Axle..... 100
Sand and Gravel Plants
A One-Man Excavating, Loading and Screening Plant 96

Excavation
Tunnel Elimination Job in West Virginia..... 86

Items of Interest
Front Cover Illustration 59
Why Do General Contractors Avoid Municipal Work in Greater New York? 75
Seasonal Labor in the Building Industry..... 79
Damaged Credit Can Never Be Completely Repaired... 84
Construction Industry News 94
Chinese Engineers to Attend Road Show..... 98
Contractors Use This Service..... 108

Law and Litigation
The Right of the Public to Detour on Private Land.... 71
Legal Points for Contractors..... 90

Material Handling
Steel Mast Serves Material Elevators and Portable Derricks 79
Special Protective Devices for Handling Pipe..... 88

Ready-Mixed Concrete Plants
A Large Ready-Mixed Concrete Plant in St. Paul..... 66

Road Construction
Fighting Snow to Lay Hot Mix Pavement..... 71
Beating the Deadline with Asphalt Distributor..... 75
Construction of the Pensacola Scenic Highway..... 76
Concrete Road Building Plant and Its Operation..... 81

Safety in Construction
Accidents to Be Minimized by New Automatic Brake for Hoisting Engines 62
Demolition to Be Made Safer in Washington, D. C.... 102

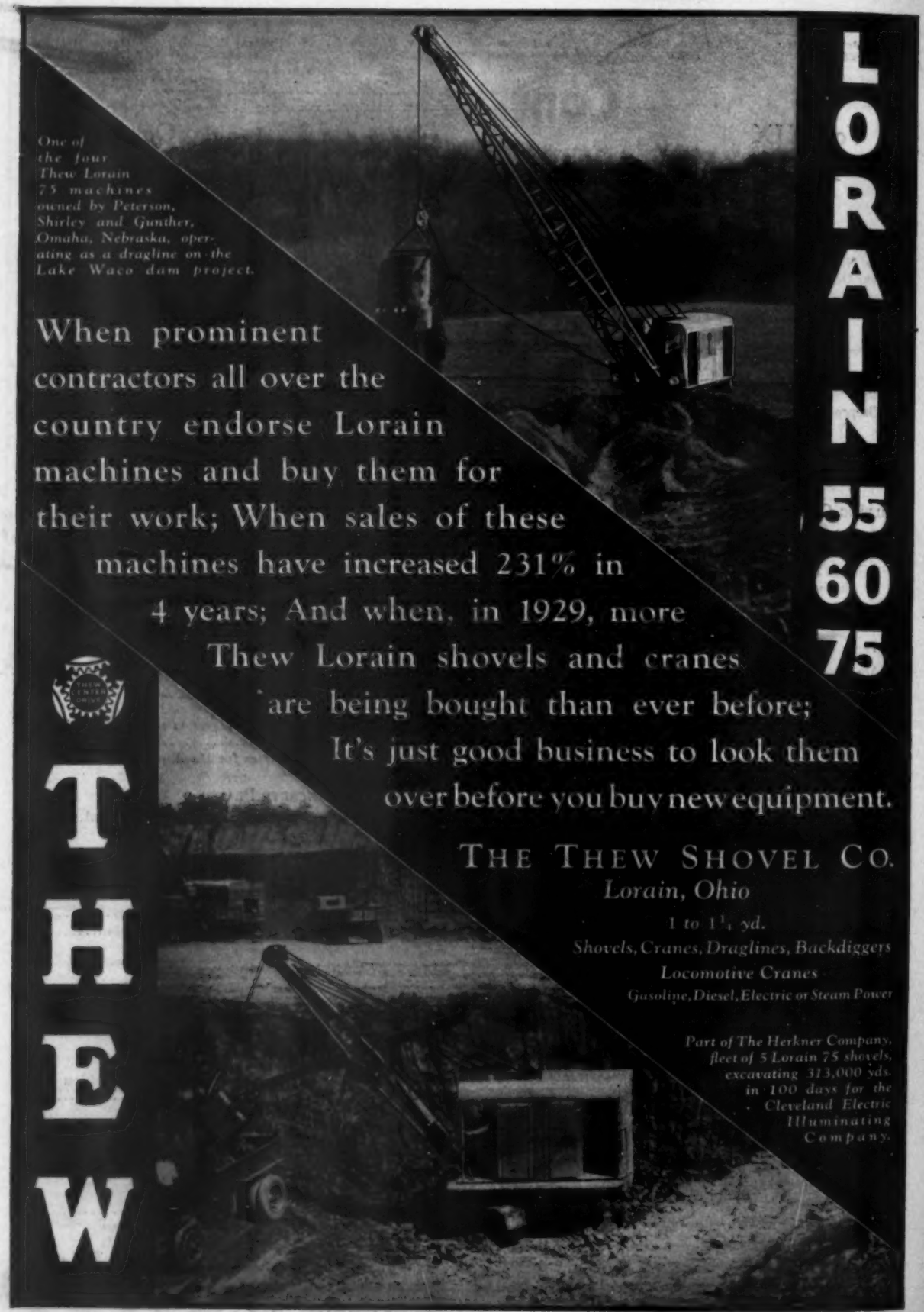
Sewers and Sewerage Treatment Plants
Contrasting Methods on Large Sewer Construction in St. Louis 51

Tunnel Construction
Tunneling Methods on the Missouri-Pacific..... 67

Viaduct Construction
Concrete Handling on 4,800-Foot Viaduct..... 72

Water Works Construction
Work on the Wanaque Aqueduct..... 85

For Directory of Local Distributors of Contractors' Equipment, See Pages 131 to 156



LORAIN 55 60 75

One of the four Thew Lorain 75 machines owned by Peterson, Shirley and Gunther, Omaha, Nebraska, operating as a dragline on the Lake Waco dam project.

When prominent contractors all over the country endorse Lorain machines and buy them for their work; When sales of these machines have increased 231% in 4 years; And when, in 1929, more Thew Lorain shovels and cranes are being bought than ever before; It's just good business to look them over before you buy new equipment.

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THEW

Vol. XIX
No. 4

Contractors and Engineers Monthly

October,
1929

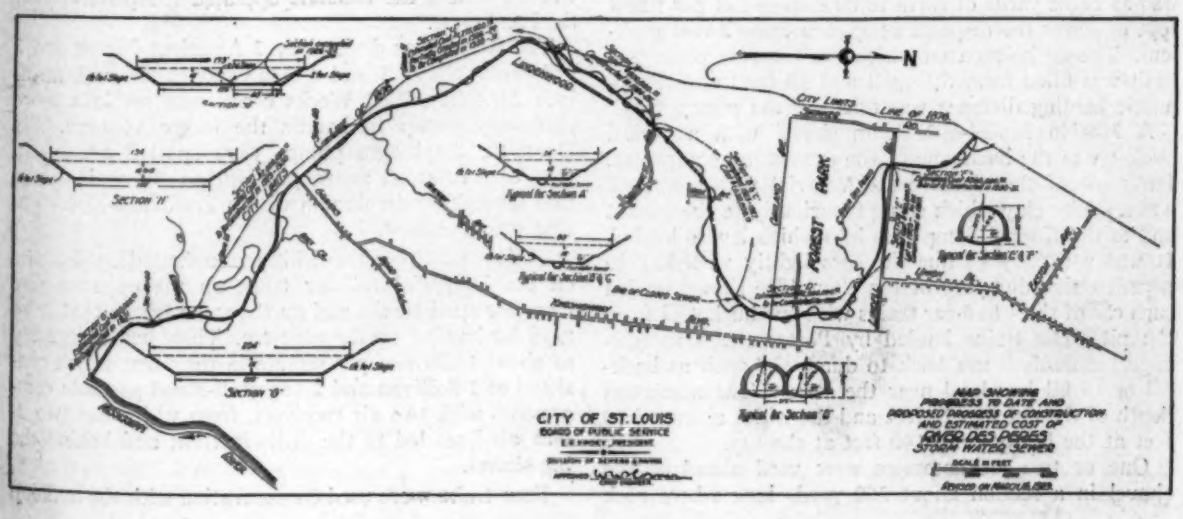
Contrasting Methods on Large Sewer Construction in St. Louis

Contractors on River des Peres Storm Water Sewer Develop Different Schemes for Handling Excavation and Concreting

FLOOD conditions have prevailed with increasing severity on the River des Peres which runs in a general north and south, though meandering, path through St. Louis. The stream appears innocent enough in normal times but with even small intense storms, rises as much as 20 feet in as many minutes. The Board of Public Service developed a storm water project, on plans prepared by W. W. Horner in 1916, which has been under construction since 1924 with new sections added to the completed project each year. By the end of 1931 it is expected that the river will be provided with a new channel throughout its entire traverse of the city. The complete program calls for the expenditure of about $10,305,000 of which $2,130,000 represents completed work, $3,550,000 is work under way to be completed by November, 1929, and the remainder, work to be let.

The sections now under construction are Sections D and E, which are being handled in quite different ways by A. Guthrie & Co., Inc., St. Paul, Minn., and W. E. Callahan Construction Co., St. Louis, Mo., respectively. There have been various considerations entering into the reasons for the different methods employed. Some are because of necessity due to the terrain and the proximity of the river and others due to the ingenuity of the men responsible for the layout of plant and program of work.

Section E, as will be noted on the map, is away from the river and hence not liable to be flooded out in case the river rises rapidly. This section consists of a single 32-foot horseshoe section concrete barrel, and is entirely within Forest Park, the largest and most attractive park within the corporation limits. Section D immediately adjacent to the south is a twin 29-foot tube section of larger capacity. Each section to be constructed below this point will be of larger capacity but of open channel type with sanitary sewers built beneath the paved invert of the channel until Section J is reached and at the point of junction with Section A a large sanitary sewer crosses the storm water sewer and takes off the sewage.



GENERAL VIEW OF THE A. GUTHRIE WORK ON SECTION D

The Marion-300 steam shovel is seen in the left foreground loading to industrial railway cars on the far bank. Following the Marion is the small dragline used to clean up, then the invert paving equipment with the concrete tower and hopper, and in the background the gantry carrying the Blaw-Knox forms and the 40-ton industrial locomotive crane at the right, used to handle the concrete from the industrial railway to the concrete hoppers. Photograph, courtesy of W. W. Horner, City Engineer, St. Louis, Mo.

EXCAVATION ON SECTION D

In spite of the fact that the path of Section D crosses the river at several points and bridges made weak points in the levee system that was built up to protect the work, A. Guthrie & Co., chose to handle all excavation from the pit loading onto trains at the top. As there was 55 cubic yards of earth to be disposed of per lineal foot of sewer the disposal of spoil became a real problem. The entire area on which the concrete plant was built was filled from the spoil and all land within economic hauling distance was filled by the contractor.

A Marion Model-300 steam shovel with a 6-yard bucket was the backbone of the excavating equipment. For most of the distance the material to be removed was a sticky clay which clung tenaciously to the bucket and to the Koppel dump cars into which it was loaded. It was necessary to line the cars lightly with hay to permit quick dumping of the clay. The shovel loaded each car of the 4 to 6-car trains with one bucketful from the pit. The trains hauled by Porter steam narrow-gage locomotives ran back to dump the spoil as backfill or to fill low land near the sewer. The maximum depth of the cut was 28 feet and the width averaged 80 feet at the bottom and 140 feet at the top.

One or two jackhammers were used ahead of the shovel in a section about 300 yards long where rock was encountered for a depth of about 4 feet within the grade. A crew of 8 jackhammers was used behind the shovel at this time with 16 to 20 pick and shovel men. A Bucyrus-Erie diesel dragline was used after the large shovel to clean up the trench. Part of the rock which was blasted was shoveled into the dragline bucket and where possible the machine operated independently of the hand crew.

The trench was drained by 2 American-Marsh and 2 Fairbanks-Morse 5 and 6-inch centrifugals with an 8-inch American Well Works centrifugal set in a more permanent sump to handle the larger volumes. Six Domestic diaphragm pumps were spotted around to take care of small areas, pumping to the main sump. One Humphrey diaphragm with a Fairbanks-Morse engine was also used.

The air plant for the drills was mounted on flat cars on the industrial railway track on the opposite side from the spoil tracks and on the same tracks that were used for hauling up the concrete. There was a capacity of about 1,000 feet per minute in the plant which consisted of 2 Sullivan and 2 Ingersoll-Rand portable compressors with two air receivers, from which the two 2-inch air lines led to the drills in front and behind the big shovel.

Four trains were used on excavation with the makeup

varying from 4 to 6 cars according to the locomotive used, as there was a 2 per cent grade to run up with the load. For the spoil trains and for handling the concrete there were a total of 6 Porter locomotives, one 20-ton Vulcan gasoline locomotive and one 25-ton Plymouth diesel locomotive.

THE GUTHRIE CONCRETE PLANT

Concrete for the Guthrie section was mixed at a central plant at one end of the job and hauled by the industrial railway using 3 and 4-car trains with 2 bottom-dump buckets per car. The railway ran under one important thoroughfare and thence to the plant where the trains came in one track, passed an automatic switch and then ran forward to the mixer to receive the load.

Sand and gravel were received by rail from the Meremac River through one of the local consolidated companies. The switch trains were made up usually of 2 cars of cement, 4 cars of sand and 6 cars of gravel, or on a ratio of 3:5:7. The sand and gravel were dumped into a pit beneath the tracks and unloaded by a 50-foot feeder belt to a 200-foot conveyor which carried it to the top of the 200-ton Johnson bin.

Cement was received in bulk and unloaded by a hand-guided power scraper into a bin from which it was lifted to the storage bin by a bucket elevator. The cement was furnished by the Missouri Portland Cement Co. About 12 cars of aggregate and cement are unloaded and used per day. The yard where the concrete plant is located has three tracks from the main spur but it was found that only two were really needed. It is possible to move a car in on one outer track and switch it back on the other outer track. There may be a time before the job is complete when this will be useful or even necessary.

A 1:2:3 mix is used with all materials weighed. The makeup of a batch on July 12 was 1,128 pounds of cement, 2,685 pounds of sand, 3,510 pounds of gravel and 60 gallons of water. The limit of water used is 62 gallons and as low as 55 gallons have been used per 2-yard batch. The aggregates and cement are dumped into a large hopper immediately above the 2-yard Smith tilting mixer and thence into the mixer itself. A minimum of 1½ minutes is required for the mix. When the train is spotted with a bucket under the chute the batch is dumped into a receiving hopper from which it flows to the bottom-dump buckets on the flat cars. A shutter gate is used which lets the flow run onto a long chute immediately above the bucket. This chute, which is cleaned each time a bucket is filled by running a board

GENERAL VIEW OF THE W. E. CALLAHAN CONSTRUCTION CO. CONTRACT, SECTION E

This view, taken looking forward toward the excavation, shows the excavation by the Monighan, the full length of the drawbridge from the top of the gantry to the side of the trench for the concrete trucks, the near side of the gantry and the forms being set. A small dragline is seen in front of the invert concreting making the final grade. This was in one part of the work supplemented with drillers and small blasting to remove a strata of rock. Photograph, courtesy of W. W. Horner, City Engineer, St. Louis, Mo.

down the trough, can be slid back by one man as the train clears from the plant, so that it will not interfere with the cab of the locomotive.

The bottom-dump buckets are a development of the Guthrie organization. On the St. Louis job about 60 of these buckets were manufactured locally and then a part of them shipped to another job. The buckets were originally developed for work on 2 miles of the Calumet-Sag Channel. The bottom along two sides is 3 inches larger than on the other two sides, permitting a quick dump of even a dry mix of concrete without any sticking.

CONCRETING ORGANIZATION ON SECTION D

The crew at the concrete plant consisted of the foreman, 2 or 3 men on the ground to switch cars with the power winch and to unload the cars at the pit, 2 men at the batcher, 1 mixer man, 1 hopper man, and 2 men on the cement car.

The complete outfit of steel forms for the twin-tube sewer was furnished by Blaw-Knox. The forms are carried on a gantry of 72½-foot span from center to center of tracks and with an over-all width of 80 feet. The forms measure 30 feet long and 5 complete sections are carried by the contractor to insure there being a set ready for concreting even when the setting of the concrete is slowed up by cold weather. The specifications permit the dropping of the inside forms when the concrete shows a strength of 1,200 pounds. No concreting is done at night but one invert section and one complete arch ring can be poured each 10-hour day. The work is continued on Sundays. In June the contractor made his best record pouring 26 completed sections.

The concrete trains pull up at the invert hopper or the arch ring hopper as desired. An Industrial 40-ton steam locomotive crane picks up the buckets and lifts them to the invert hopper from which the concrete is run out as desired to either side of the center wall. When concreting the arch ring the concrete is dumped into the other hopper and run out onto a General Conveyor Co., belt through a chute and choke to arch the concrete to minimize spilling as the belt is only 16 inches wide. This system has worked admirably throughout the concreting. The first set up was for the use of a high tower and chuting equipment but this was found rather ungainly to move along the bank and too heavy for the unsupported bank to hold when the weather was wet. The conveyor belt delivers the concrete to a central hopper from which it is distributed by a gate to 6 chutes.

The invert crew for reinforcing consists of the foreman, 1 hoist operator to handle the steel, and 11 men. The crew for moving and setting the forms consists of 1 foreman with 4 carpenters, and 19 men. The concreting crew consists of 2 foremen, 1 crane operator, 4 locomotive engineers and 4 trainmen, and 36 men.

EXCAVATING ON SECTION E

The W. E. Callahan Construction Co., of St. Louis, the low bidder for Section E, used a Monighan dragline with a 6½-yard Page bucket operating from the top of the trench and casting to a high spoil bank. In this section there was a small amount of rock to be excavated in the bottom of the 40-foot trench. The top width of the trench averaged 130 feet and the bottom about 40 feet. The clay varied from red on top to gray, then the shale for the bottom 5 feet of the trench.

Inasmuch as this section is in an exclusive and restricted neighborhood, the noise of the portable air compressors, the diesel engine of the big dragline and the exhaust of the tractors would be very annoying, particularly during the night shift. In order to prevent any trouble or possible injunctions every piece of power machinery was equipped with Maxim silencers making the job remarkably quiet.

The section to be concreted is a single arch having the capacity of a 32-foot sewer and with arches designed for 10, 15, and 20-foot fills. The section is 5,650 feet long and the bid price was $872,000.

Backfilling of the completed sewer is handled by a P & H 700 gasoline dragline with a Page bucket, one Bucyrus-Erie diesel dragline and one 2-yard Monighan dragline, after the concrete has passed the requirement of 1,200 pounds which it has attained rather uniformly at 72 hours.

The rock drilling in the bottom of the trench was handled by a crew of men operating Ingersoll-Rand jackhammers supplied by portable compressors of the same make.

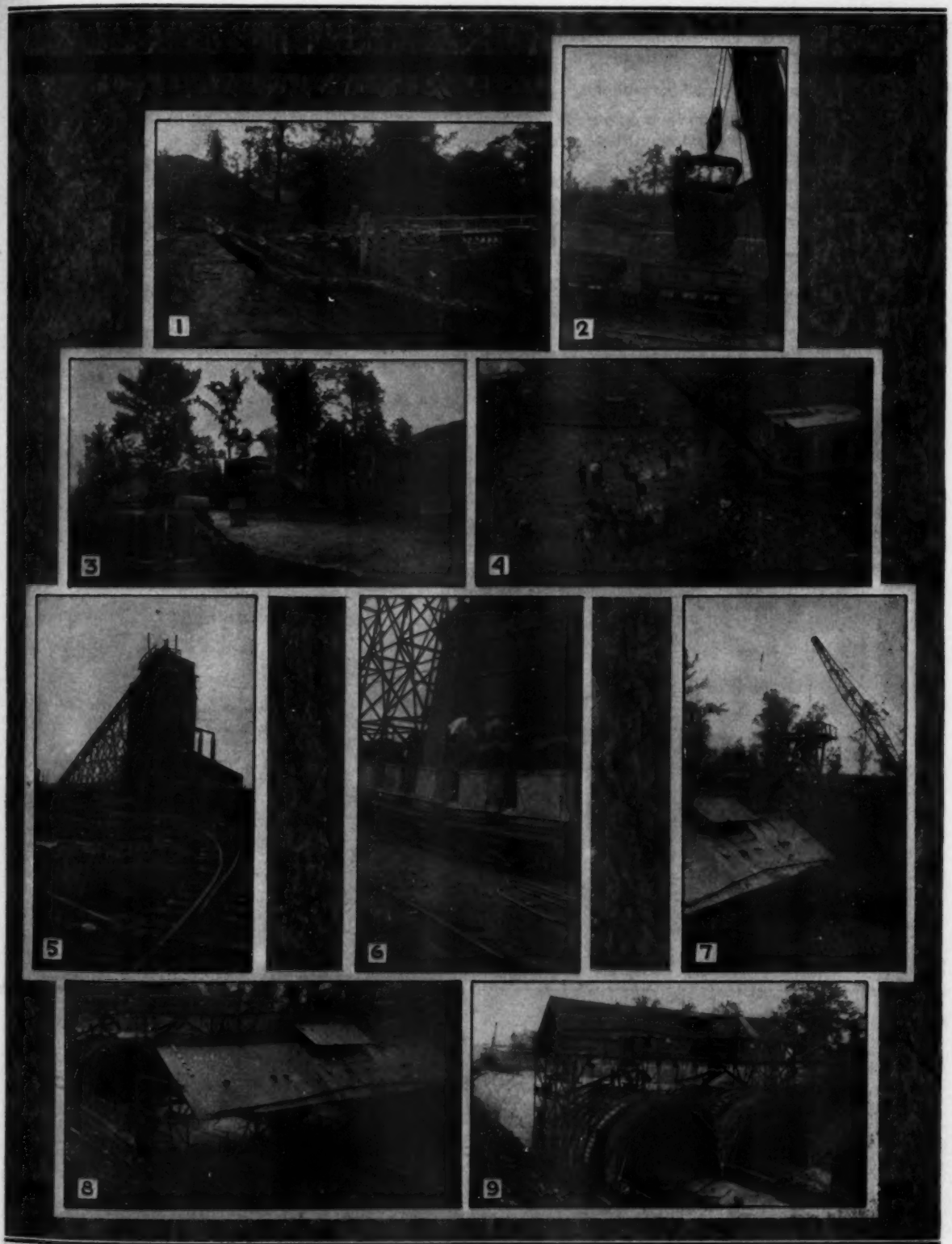
CONCRETE PLANT OF CALLAHAN CONSTRUCTION CO.

The central mixing plant for the Callahan section is located at one end of the job. At the plant gravel and sand are unloaded from the switch trains into a hopper from which a 52-foot feeder belt delivers the aggregate to the main belt 130 feet long which empties into the Blaw-Knox bins equipped with Blaw-Knox weighing batchers. Both the belts used are General Conveyor Co., products. The Marquette cement is delivered in bags and unloaded by hand trucks to an elevator which raises it to the mixer platform. A 2-yard Smith tilting mixer is used driven by an electric motor. The crew operating the plant consists of the foreman, 1 man dumping 12 bags of cement to the batch, 1 man on the hopper, 3 men unloading cement, 1 man weighing, dumping and handling the mixer, and 2 men unloading the 11 cars of sand and gravel which are used each day. An electric hoist is used to spot the cars although there is a slight down grade for moving the loaded cars to the pit. Very small stock piles are maintained.

The concrete is hauled in 2-yard loads by a subcontractor at a ton rate. The concrete is delivered to the forms over a steel draw bridge leading to the top of the gantry carrying the Blaw-Knox steel forms for the sewer. There are 4 sets of forms which allows the contractor to strike the inside forms in ample time to use them ahead after the concrete has reached the specified strength. One 36-foot section of the arch ring and one invert section requiring 280 yards of concrete are poured in the 8-hour day shift each day. Pouring of concrete started on April 10, and an average of 19 sections per month has been completed.

GANTRY USED AS A CARRYALL

The steel gantry for the forms is used by the Callahan organization to carry the field office with a telephone, water, electric lights and a change house for the men. It also carries the drawbridge over which the concrete batch trucks back to deliver the load to the hopper over the arch forms. The drawbridge is lifted and lowered as required for moving the gantry by a



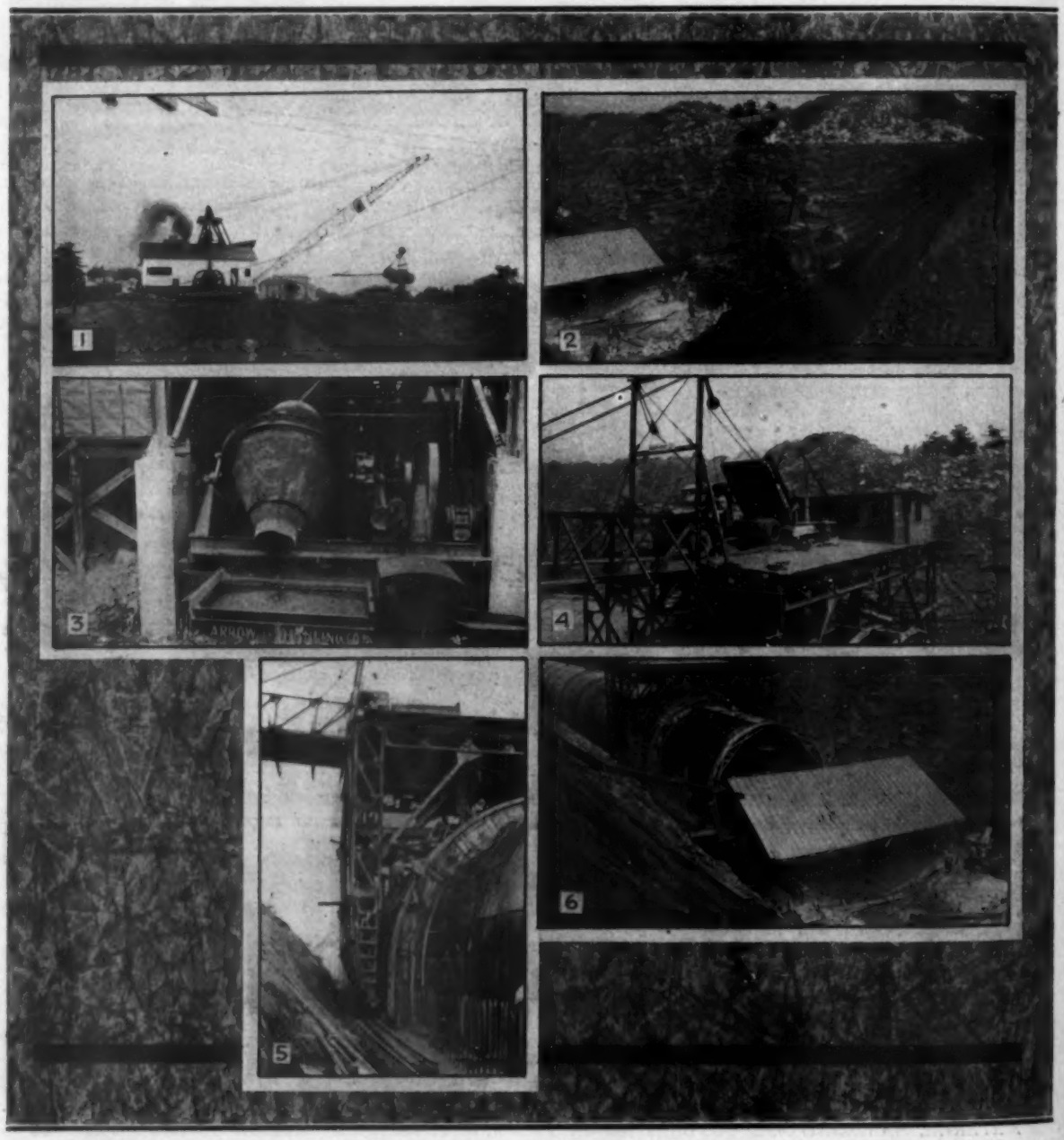
MATERIAL HANDLING AND CONCRETING ON THE A. GUTHRIE & CO. SECTION OF THE RIVER DES PERES SEWER, ST. LOUIS, MO., SECTION E

1. It was necessary to use sand bag defenses at times when the flashy stream rose rapidly. 2. The Marion-300 loading Koppel cars on the bank 28 feet above the bottom of the trench. 3. The compressed air plant mounted on industrial railway cars. 4. Drilling the rock in the bottom of the trench behind the Bucyrus-Erie E-2 dragline. 5. The central concrete mixing plant served by industrial railway. 6. Loading the bottom-dump buckets on the flat cars. 7. The locomotive crane lifting buckets to the hopper at the invert concreting shed. 8. General view of the invert concrete work. 9. The gantry with the forms for the sewer and the four-way chutes for handling the concrete seen in silhouette

Sasgen hand winch, and 4 others are used to move the gantry and the forms. Two are mounted to move the inside forms and 2 for the outside forms.

STEEL FORMS SETTING

The steel forms are made up in two sections each for ½ the arch. Each section has 3 chord braces and there is a jack for holding the centers together and another at about the mid point of the sides of each section. A 4-foot apron at the bottom provides a connecting link with the invert. Tapered 1½-inch to 1⅛-inch bolts hold the forms together at the proper spacing. These holes are not filled in the concrete shell after the forms are removed but are to be left as weep holes to drain the upper section of the trench. The contractor uses the holes to good advantage for bringing in electric light wires and for driving in wood plugs temporarily to support the wires as they are strung along the interior for the final finishing. The interior was remarkably free from any honeycombing despite the difficulty of puddling in the forms with the large amount of heavy reinforcing and the curved section of the arch.



BUILDING THE RIVER DES PERES PROJECT, SECTION E, W. E. CALLAHAN CONSTRUCTION CO., CONTRACTORS

1. The Monighan walking dragline with 6½-yard Page bucket. 2. The bucket starting up the slope with full load. The pit was about 40 feet deep at this point. 3. The electrically-driven Smith mixer which supplied the concrete for the entire length of Section E. 4. Truck dumping concrete into hopper on the gantry which supported the forms for the sewer. 5. Detail of the gantry at one side, showing the drawbridge at the top. 6. The invert concreting shed with the chute from the hopper at the top of the trench shown on the left

When the concrete was dumped into the hopper on the gantry it was controlled by a hopper man below who directed the semi-fluid material to any one of the 8 chutes by means of a swivel head. A crew of 6 or 8 men depending on the temperature were used in the forms to tamp and spade the concrete. There were a foreman and 2 spout men.

When concreting the invert the concrete was dumped into a hopper direct from the trucks and run down a chute direct to the invert on the near side or to buggies and wheeled across to the opposite side.

Inasmuch as this section of the River des Peres sewer is at some distance from the river and in relatively high ground little difficulty was experienced from water except in wet weather. A 6-inch Wood trash pump was sufficient to keep the trench sump dry, running about one hour a day.

A 1:2:3 nominal mix is used for this section with the water controlled by the water-cement ratio. The 2-yard batch on July 10 was made up of 480 pounds of water, 2,700 pounds of sand and 3,500 pounds of gravel with 12 bags of cement.

PERSONNEL

The River des Peres project is being constructed for the City of St. Louis under the direction of W. W. Horner, Chief Engineer, with Thomas Knobel as Engineer of Sewer Construction, and W. R. Denison as Resident Engineer. E. H. Bruntlett is Superintendent for A. Guthrie & Co., St. Paul, Minn., and T. G. Rivers is Superintendent for the W. E. Callahan Construction Co., St. Louis, Mo., with E. E. Ashlock as Assistant Superintendent.

Are You Kidding Yourself About Your Used Equipment?

By C. F. Lytle

President, C. F. Lytle Construction Co., Mexia, Texas

IN considering and accounting for depreciation and absolescence of equipment, particularly equipment used by contractors for public work, it is necessary to remember that the successful contractor buys equipment for the job and not the job for his equipment, and, therefore, it is a part of the expense of the job, the same as material and labor used on the work. On the completion of the contract there is no assurance that another contract can be secured at a satisfactory price. Competition is so keen that all public work is being taken on a very small margin.

OTHER INDUSTRIES NOT COMPARABLE

There is a sharp line of distinction in the depreciation and obsolescence of machinery and equipment in the different industries.

The machinery used in the manufacture of shoes or other like merchandise is placed upon a good foundation in a permanent building, operated and cared for by the same employee the year round, working on an eight-hour six-day basis, making merchandise, which, if good, establishes a reputation and good will, which leads to repeat orders in business, which keeps the factory working continually for many years.

The contractor, particularly one engaged in the construction of public work, secures a contract sufficiently large to justify the purchase of equipment. In these days of keen competition his margin is usually very small. The seasons being short, and the occupation being seasonal, the equipment is working long hours, possibly night and day, at its utmost capacity, under most unfavorable conditions, and usually by irregular and often incompetent employees. On the completion of the job the equipment is always in bad condition and usually at considerable distance from the owner's headquarters. The expense of loading and shipping it to the headquarters is prohibitive so it is usually left or stored near the work just finished with the hope that another contract may be secured, to which the equipment may be shipped direct. When the contract is completed, no matter how honest and faithfully the contractor has carried on the work, the reputation he has made will not aid him in getting new work. Unless he bids a lower price on new work than any of his competitors, he is not awarded the contract. It is seldom that a contractor with equipment at or near the site of new work secures the contract for his competitors take that into consideration and bid lower on that account.

MAKE THE JOB PAY FOR THE EQUIPMENT

For the past thirty years the writer has been actively engaged in construction work, besides financing and assisting other contractors in like work. When the business was first started the practice was established of not buying any equipment unless the job, for which it was bought, was sufficiently large to charge off the cost of the equipment bought for the work. If it was ever used on a subsequent job, no part of it was charged again except the cost of repairs or overhauling to put it in usable condition. If the equipment had any value, such value is then reflected in the profits or loss on the job, on which it is subsequently used. No equipment has ever been carried as an asset on our books or given in any financial statement.

DON'T RELY ON SECOND HAND EQUIPMENT

Successful construction work is organized as a unit, in which each machine and man is an integral part and must work in unison. If any piece of equipment fails

or does not work efficiently, it stops or delays the entire operation. Therefore, while a second-hand machine may work fairly well part of the time, an occasional breakdown or delay by stopping or delaying the entire operation, may render that machine a big liability instead of an asset.

The largest loss per mile of road we ever had was on a small contract by trying to use second hand equipment, which had only been used on one previous large job. It looked alright but first one piece of equipment and then another would fail or get out or order, each in turn delaying the whole operation and entailing a large loss.

Many contractors for various reasons prefer to carry their used equipment on their books as an asset at substantially its original cost. Statements are often made by some contractors to banks and surety companies showing equipment listed at its original cost plus all repairs made on it. Some of these statements apparently were made with no intention of deceiving. They were simply fooling themselves in trying to think they were making a profit.

NEW MACHINES PAY PROFIT

A large well-financed construction company had about completed a large project when another equally large project of the same kind of construction adjoining the work being completed, came up for bids. The contractor had made no profit on the job being completed but thought by having his equipment on the ground, he had the advantage of the other bidders. He had originally equipped the job with reconditioned second hand machinery, which looked and was thought to be alright, and completed the work with it. When bids on the new work were opened, it was found that another contractor with no equipment within a thousand miles of the job, had a lower unit price than the first contract had been let for, and was awarded the new contract. The first contractor then tried to sell or rent his equipment to the successful bidder but was told his equipment would not be taken as a present to be used in the construction of the work. The new job was then equipped with brand new and uptodate equipment from the factory. Being all new, each machine did its work in unison with others, worked long hours, part time night and day, cut the operating cost of the first contractor in two, thus making a good profit even though they had a lower price.

Any machine, upon whose perfect functioning machines or groups of men depend, must function perfectly or become a big liability instead of an asset.

HIGH PAPER VALUATIONS DO NOT PAY PROFITS

Capitalization of equipment by contractors leads to many abuses and evils. The financially weak or foolish contractor will keep his equipment at the highest possible value on his books and statements, pay taxes or even income tax when there is an actual loss, in order to prove to his stockholders, creditors, bankers or bonding company that he is in good financial condition. Then there is the contractor in better financial condition, who by placing a high value on used equipment becomes psychologically imbued with the idea he can not afford to let so much value lay idle, and takes work at too low a price just to keep his equipment busy. If he had charged it off to the job, for which it was bought, as he should have done, the temptation to take unprofitable work would be very much less.

The equipment of a corporation, whose manager is a minor stockholder, and who with perhaps his superintendents receive as a bonus a share of the profits on jobs, will always be found carried on the books at the highest posible value. A stockholder of such a corporation brought his statement to me with the inquiry as to why while the statement showed the corporation was making a profit, he had never received a dividend. A careful check of the equipment and bonus account showed why he had received no dividends, and a careful examination of the physical condition of the equipment brought him the convincing information he had better charge off the original investment and forget it. The mortality is great in construction work.

MANUFACTURERS AND ENGINEERS CREATE OBSOLESENCE

Obsolesence becomes greater as any branch of construction work becomes more specialized and competition keener. Every manufacturer has a corps of engineers and experts working continually to refine and improve his line of machinery and to design new machinery. When a new machine is brought out which will do better work, or be more efficient, the contractor, of course, must buy the new and discard the old to meet competition.

Engineers in charge of work make new designs and new requirements, which in turn require new equipment and new methods. With the keen competition existing now, the contractor, who on finishing a contract, has the nerve and good judgment to wait until he can secure another contract at a reasonable profit, may wait one or more years and then find obsolescence and rust have depreciated his equipment to a place where he can not afford to use it at all. If he carried it as an asset, he has to charge it off then and start the new job with a loss, to which it is not entitled, besides buying new equipment.

TAKE A HINT FROM THE OIL PRODUCERS

In the production of oil and gas the law specifically gives the owner the right to charge off the entire cost of the well the first year. This is as it should be as the well may stop producing any time, but it is no more than a contractor, who buys equipment for a job, should do for he does not know where or when, if ever, he will get another job at a price he can afford to take it at. Every business has its hazards and it is no more good business to anticipate or guess that second hand equipment will function efficiently or that profitable work can be secured than to assume that an oil or gas well will not stop producing.

MAKE EACH JOB A SEPARATE FINANCIAL UNDERTAKING

When a large public work job is completed, it is a closed transaction. The contractor has no knowledge or means of knowing when or where, if ever, he will get another job, and if he has any equipment left on the completion of that job, in no event should it be valued at a greater price than it can be actually sold for cash to a second hand dealer on the "as is, where is" basis. Any other method is purely speculative and anticipating something that may never happen.

Over two years ago we finished a large bridge job in Florida, for which a large number of barges and similar equipment had been built new. When the work was completed no other work was in sight. The barges were stored up the river and a watchman employed for over two years, with not enough of the salvage sold during that time to pay one-tenth the watchman's salary. The final result was that the entire lot was given to the Boy Scouts organization for a play ground. This equipment was charged off to the job but kept with the faint hope that something might turn up, upon which it would be useful. Had it been capitalized, we would now be in the position of having to charge off with no profit to charge it against.

To summarize: Each major public works project is a separate and distinct undertaking.

When a project is completed the books should be closed and the actual results obtained on the cash expenditures and receipts basis, and not speculate or gamble on the future by capitalizing equipment, of which no use may ever be made.

DON'T DECEIVE YOURSELF

Many a contractor by capitalization of equipment has deceived himself, his stockholders and creditors into the belief he is making money until receivership or bankruptcy brings his business to an end.

It should be remembered that a public works contractor has established no good will, no matter how efficiently or honestly he has done his work, and, therefore, anything he has left on the completion of his contract is at most only worth what it will sell for "as is, where is," for cash.

It should be remembered the mere fact that a contractor has equipment at or near the place of work to be let, tends to lower the bid of his competitors on account of his having the equipment so located.

It must be remembered that new designs, methods and equipment are continually being brought out, which may within a very few months render obsolete equipment which is not physically worn out.

It must be remembered that all successful construction jobs are highly organized and that each man and each piece of equipment must function perfectly and in unison with the other equipment on the project.

It must be remembered that if new work is secured, it may be hundreds of miles from the last job, on which the equipment was used. The work of storing, overhauling, loading and moving may be more than any real value which can be gotten out of the equipment. When it is placed upon the new work, any part of it which is not efficient, may delay and hinder the work on the whole project, and thus cause a damage amounting to more than the cost of entirely brand new machinery.

It should be remembered that if a second hand machine has any value, its true value will be reflected and accounted for in the profits or loss on the job, on which it is used.

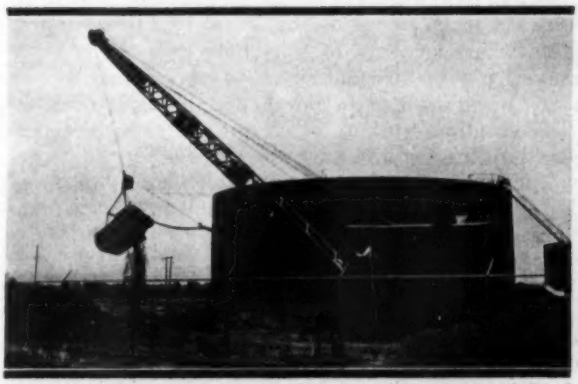
It should be remembered that the capitalization of equipment psychologically leads to the bidding of lower prices "in order to keep the equipment busy."

Every contractor should remember that he is engaged in one of the most hazardous occupations with a hope of financial reward in such form that it may be used to buy the necessities and even the luxuries of life, to which a contractor who has spent his life in the construction work, is entitled.

Extensive Construction for New Refinery at East Chicago, Ind.

AN entirely new refinery and storage plant is now being built within the city limits of East Chicago, Ind., on a tract of land that was mostly swamp, muck and sand, by the Empire Refining Co., one of the Cities Service group. The site is about 3 miles from the shore of Lake Michigan, adjacent to numerous trunk line railroads and has an area of 372 acres.

The first operation was to completely enclose the grounds with a Cyclone fence 6 feet high, calling for 3½ miles of fence. Following this one of the major undertakings, the grading of the site, was started by A. F. Hartigan Co., Hammond, Ind. This work entailed the handling of approximately 800,000 yards of excavation, as well as about 3,000 yards of old concrete. For this work five Link-Belt crawler cranes, equipped with dragline buckets, changed to clamshell buckets when necessary, were used. These machines moved over the hills and through the muck speeding up the work of grading.



One of the Link-Belt Cranes Used for Excavation and Steel Erection on the New Empire Refinery Tank Construction Job. One of the Tanks in the Background.

One of the 1½-yard machines averaged 1,500 cubic yards per day of drag and fill and the 1-yard machines averaged 1,000 yards per day, according to R. E. Oliver, Superintendent for A. F. Hartigan Co.

The erection of the storage tanks, totaling 2,000,000 barrels capacity for crude oil and gasoline, was let to the Chicago Bridge & Iron Co., and for the smaller tanks to the Graver Corp. There are eight tanks of 80,000 barrels capacity, 15 of 55,000 barrels, 12 of 10,000 barrels, 14 of 5,000 barrels, 6 of 3,000 barrels and 20 11 x 40-foot horizontal steel tanks. The handling of the steel for the tanks was sublet to A. C. Proudfoot Co., Hammond, Ind., who have handled nearly 8,000 tons of steel with two Link-Belt cranes. These machines were also used for building excavation work where 3,555 yards of sand were removed in 37 hours with a 1-yard bucket.

Front Cover Illustration

We are privileged to publish the etching by Dehmann on the front cover of this issue of CONTRACTORS AND ENGINEERS MONTHLY, showing the foundation construction for the new Chase National Bank Building, New York, through the courtesy of Mr. Dehmann, the Randolph Collections and the Foundation Co.

Contractor Saves $20,000 in Eight Months with Diesel Dredge

Julius Keg Replaced Compound Steam Engine With 180-Horsepower Diesel for Fox River Job

AN interesting comparison of the savings possible with diesel power in dredging operations is found in an A. C. Nielsen Company survey covering a dredge operated by Julius Keg, McHenry, Ill., on the Fox River near that city. In April, 1929, a second-hand compound steam engine with a boiler of approximately the same rating which had served for three years, was replaced with a 180-horsepower Buda-M.A.N. diesel. The change was made to gain in reliability of operation and also to reduce the labor and fuel costs. The economy already demonstrated amounts to 6.7 cents per cubic yard in direct power costs which amounts to something over $22,000 per season, plus a substantial added saving due to the maximum utilization of the dredge during the season.

The contract work on which this dredge has been engaged during the last eight months is a real estate development project located about eight miles south of McHenry. The dredge was used to fill in low land and to create a bathing beach.

Original Equipment

The original drive for the 10-inch dredge pump was a marine engine with 7 x 12-inch and 16 x 12-inch cylinders, rated at 170-horsepower and 180 pounds steam pressure. Steam was supplied by a boiler which was also purchased second hand. The engine was operated at 300 revolutions per minute. The equipment took up much space on the dredge, was frequently down for repairs and was expensive to operate. The failure of the steam operation was not due to any inherent deficiency in steam as a motive power, but to the fact that the engine could not be speeded up sufficiently to carry the necessary pressure on the line, this being partly due to boiler trouble. The dredging operation tended to foul the water used as boiler feed and neither filtering nor boiler compounds were able to correct the trouble. As a result water carrying solids went over with the steam and scored the cylinders. Repairs were frequent on boiler, feed pumps and engine.

Preparation for Diesel Installation

At the time the diesel engine was installed, all of the old machinery and the superstructure were removed, leaving only a bare hull which was constructed with a framework of 6 x 8-inch timbers with 3-inch bottom planking, 6-inch end planking and 6-inch and 4-inch side planking. The side of the hull is 75 x 20 x 5 feet. Since the hull had been subjected to considerable strain by the use of the steam power, it was strengthened by 6-inch channels placed back to back and extending transversely on the bottom. At the side of the hull vertical structural members were bolted to the side of the hull and connected to the channels on the bottom of the hull by means of a gusset or knee of steel plate. On top of the transverse beams were placed longitudinal H-beams spaced 3 feet apart and on these H-beams the structural base of the engine and the pump base were mounted.

Reference to the illustrations will show that the engine and pump center lines are not at right angles with the center line of the dredge. This method was adopted to secure proper rotation of the pumps without changing the suction or dredge discharge and to secure proper trim of load in the hull. Installing the diesel engine in this manner also facilitated the construction of the suction and discharge line. The present arrangement permits ample working space around the engine and pump.

Diesel Engine

The diesel is a standard 6-cylinder Buda-M.A.N. diesel engine capable of operating at any speed up to 900 revolutions per minute, and delivering 180-horsepower at full load and speed. It is belted to the pump. The operating speeds are from 650 to 850 revolutions per minute at the present time.

Operation

A 10-inch pipe is carried inland from 400 to 1,400 feet. With the steam engine the maximum length was found to be 1,000 feet, whereas the diesel has ample power and pumps double the former yardage at 1,000 feet and loses only a small percentage of capacity at the maximum length of pipe line so far used.

For each swing of the dredge about one foot of depth is taken. The dredge is stepped ahead 30 inches at a time which is the width of the cutter, for each cut. About three minutes is required for a full swing.

The dredge is operated about eight months of the year. When the steam engine was in use only about one 10-hour shift was worked for 6 days a week, but with the diesel in service, operation was so free from trouble that two shifts were started. That practice has been continued. Records kept by Mr. Keg show that for the entire period of diesel operation, 90 per cent of the operating time has been spent in actual pumping of 9 hours a shift, the lost time being almost entirely due to moving the dredge and laying new pipe line. When steam power was used, 5 hours a week was spent in washing the boiler and an average of another 5 hours for repairs to engine, boiler feed pump, etc. This down time was in addition to the time now lost for moving the dredge and general dredge repair which

accounts for the present figures of 90 per cent actual pumping time.

COMPARATIVE OPERATING COSTS OF POWER UNITS

The steam engine was purchased for $250 and $60 for trucking and $48 for labor to bring it to the shore. About $1,000 was spent for the boiler, foundation material, feed water pumps and complete installation, making a total of $1,358.

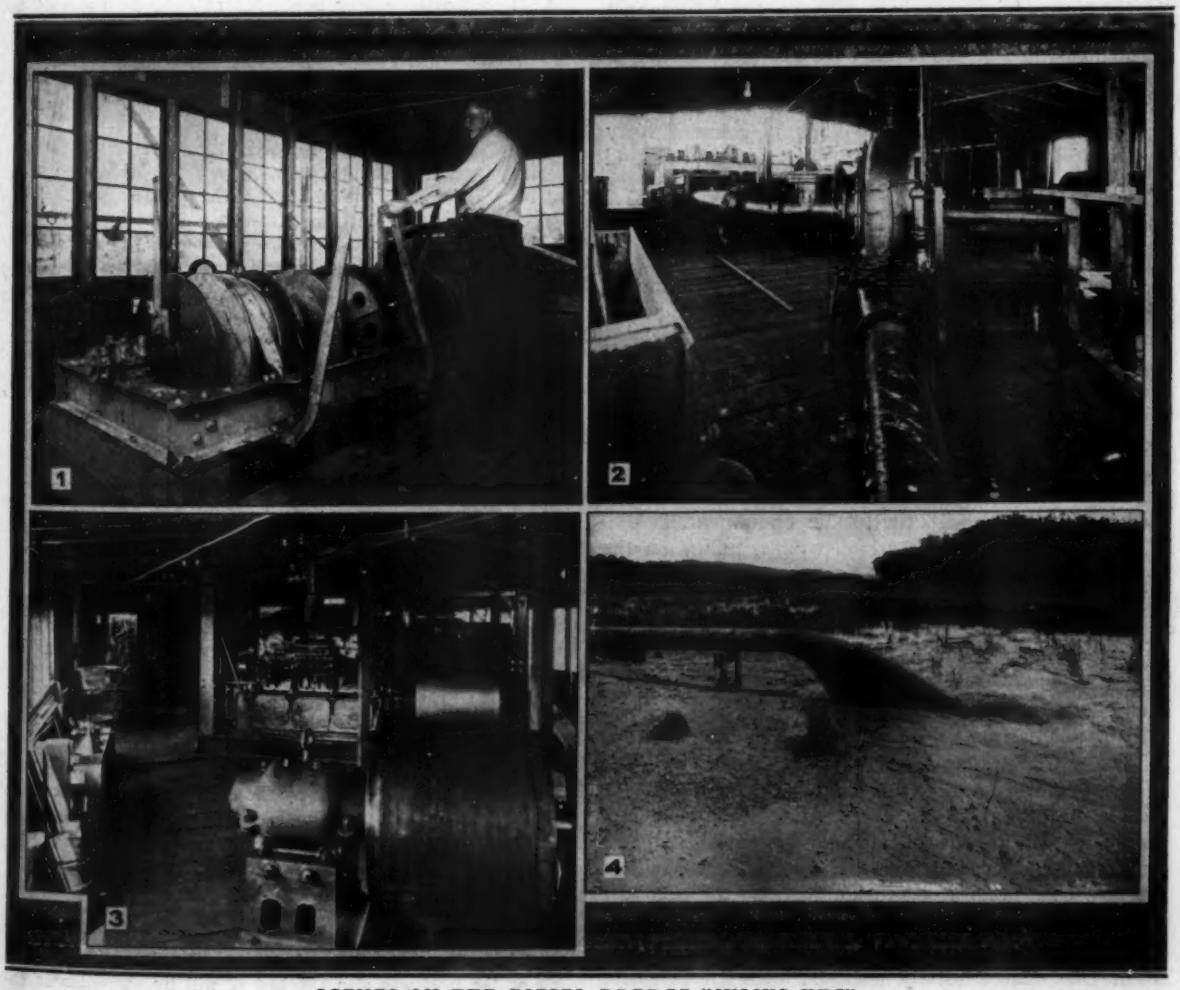
The first cost of the diesel engine was $12,140 plus $45 for trucking and approximately $75 for installation. The fuel oil tanks cost about $300, making a total of $12,560.

In figuring the comparative operating costs, depreciation and average interest are based upon a life of 10 years, although it is thought that both the steam and diesel engines might be expected to serve for far more than that period, particularly on an operation of this type. No record is given on repair and maintenance costs on the old equipment, but it is estimated that not less than $800 was spent per year. The diesel engine has not been in service long enough to show any repair costs and an allowance of 2½ per cent or $250 is made. The total fixed charges are $980.61 for the steam and $1,920.48 for the diesel unit. These correspond to costs per shift worked of $4.71 and $4.62, respectively.

The operating costs per shift are made up of the above fixed charge, fuel, lubricant, boiler compound and miscellaneous supplies and labor. For steam operation fuel costs were high, the average consumption for a 1-hour shift being 3½ tons of coal at $8.50 a ton or $29.75 delivered at the shore line. Delivery to the dredge cost an additional 50 cents a ton. One man at $6 a day handled 12 tons from shore to dredge.

The consumption of fuel oil by the diesel engine averages fifty gallons per shift at a cost of 6.5 cents per gallon or $3.25 per shift. Fuel is delivered from a truck on the shore to the dredge at a cost of $2.40 for labor for an 805-gallon tank or 15 cents per shift.

Lubricant is estimated to cost about 35 cents per shift for the steam engine and ¾-gallon of 65-cent oil is now used per shift on the diesel, costing 49 cents per shift. Boiler compound and miscellaneous supplies cost approximately $1 per shift under former operation and 20 cents is now allowed. Steam operation required an engineer at $10 per shift and a fireman at $7. Present operation is without the fireman. The total cost



SCENES ON THE DIESEL DREDGE "JULIUS KEG"

1. *The operator at the controls and hoisting drums.* 2. *The* 10-*inch Amsco pump, which is belt-driven by the diesel.* 3. *Looking toward the stern of the dredge, showing the diesel engine and belt drive.* 4. *Discharge from the* 10-*inch pipe line*

per shift are thus found to be $54.56 for steam operation and $18.71 for diesel operation. With 7.3 and 9.0 hours of actual pumping, the cost per hour of pumping becomes $7.47 and $2.08 respectively.

Unit costs for power under the actual conditions of single shift operation for steam power and double shift operation for diesel power are thus 9.34 cents and 2.31 cents per cubic yard respectively. Under double shift operation for the steam unit, it is estimated that an additional $300 would be expended for maintenance and repair on the steam plant. By adding this figure to the total fixed charges, the charge per shift becomes $3.07 for the steam and $4.62 for the diesel unit. Operating costs would be the same per shift except for the change in fixed charge on the steam unit. The total per shift then becomes $52.92 for the steam unit, corresponding to a cost per cubic yard of 9.06 cents, while the cost for the diesel unit would remain at 2.31 cents.

DIRECT SAVINGS

The difference shown in cost per cubic yard for double shift operation of both units is 6.75 cents. Pumping an average of 810 cubic yards per shift makes the saving $54.67 per shift. At steady operation for a full season, at this rate, 416 shifts, the saving would be $22,742.72. The entire first cost of the diesel unit would thus be returned nearly twice in the full season at the above rate if 400 shifts were worked.

An added saving in fixed charges is effected due to full utilization of the dredge through avoidance of lost time for equipment repairs. This is comparatively small but with approximately $20,000 of capital tied up in the dredge over the cost of the diesel engine the importance of a full operating schedule is evident.

AUXILIARIES

Lighting is taken care of by means of a 1½ kilowatt gasoline-driven generator set. This provides light at all times even though the main engine or cutter head engine is not in operation.

Priming is taken care of by a Morris 2½-inch pump which is driven from the shaft supplying power to the cutter head and operates a Penberthy ejector. Power for this pump and the cutter head and hoist is supplied by a 40-horsepower gasoline engine which was used in connection with the former equipment.

A 2-inch service pump driven from a pulley on the diesel engine supplies water to the pump bearings and for servicing. A line from this pump also extends to the cutter head bearings. A flap valve is placed in the discharge line close to the 10-inch American manganese pump.

Pressure and vacuum gages are placed in a convenient position so that the operator can see them at all times. A line has been run from the diesel engine to the operating station showing oil pressure on the lubricating system at all times. Cable controls have been extended to the operating position so that the diesel engine speed may be increased or decreased to suit the conditions of operation without the necessity of walking back to the engine.

The power take-off from the engine is by means of a Twin Disc clutch totally enclosed with an extension shaft supported by a Timken outboard roller bearing. The driver pulley on the engine is a Rockwood paper type. The clutch can also be handled from the operating position. One man only is required on the dredge for each shift and the entire equipment is under control from his station at the front end of the dredge.

The engine pulley is 18 inches in diameter with a 22-inch face. The belt is two-ply endless leather with a center distance of 13 feet. An idler pulley is used to maintain a proper tension on the belt.

The starting equipment for the diesel engine consists of a small, air-cooled, 2-cylinder opposed type gasoline engine mounted directly on the flywheel housing and starting the main diesel through a special type of Bendix drive. Compressed air is not required for any purpose on this dredge.

The Buda-M.A.N diesel engine weighs, complete, 12,700 pounds. The overall length from the radiator to the end of the power take-off shaft is 138 inches. The overall width is 49 inches. The height over the radiator filler cap is 89¼ inches. The exhaust of the diesel is quieted by a Maxim silencer.

Accidents During Process of Raising Materials to Be Minimized by New Automatic Brake for Hoisting Engines

AN automatic safety brake for hoisting engines that is destined to minimize accidents and loss of life which occur during the process of raising building materials to the upper floors of buildings under construction has been devised by Robert C. Post, Vice-President of Post & McCord, steel constructors, New York.

The new brake has been subjected to severe tests and successfully passed inspection by a large group of construction experts. It is in practical use at the present time. The device combines three simple features not hitherto used on hoisting engines, and removes as far as possible the human element in construction accidents caused by the failure of the engineer to act promptly. Some of the most serious accidents occur when a fuse blows out while a load is being hoisted, and the engineer fails to realize the situation quickly enough to act before the load obtains such momentum in its descent that the foot brake fails to hold. This new brake is designed to meet such emergencies.

Most hoisting engines have only one service brake, operated by a foot pedal. The new device adds a second brake, which is electrically controlled and which sets when the current is cut off from this controller. It is set in three ways: a cut-out switch is placed in connection with the foot lever of the present service brake, so arranged that when the foot is removed from the pedal the current is cut off from the controller of the automatic brake, thus setting this brake. Therefore, if the engineer is forced to move from his position, becomes ill or otherwise suddenly incapacitated, the load is prevented from falling by the setting of the automatic brake.

Or if the fuse on the line supplying the engine motor blows out the current controlling the automatic brake is consequently cut off and the brake sets. Hand switches are provided along the line supplying the current to the controller of this brake so that it can be set at will by the engineer by simply cutting off the current.

The tests were made by means of a 100-horsepower engine, a wooden stiffleg derrick and a load of 5,500 pounds. A single cable or part was used at the start, and this was later changed to a three- and a four-part rigging. The brake acted at once when the fuse blew out and likewise when the engineer removed his foot from the brake pedal. The lowering or hoisting of the load was also checked at will by the engineer entirely independent of the foot brake by throwing a switch located near the other control levers of the engine.

Material Handling on the New Dominion Square Building in Montreal

By Allan E. Bone

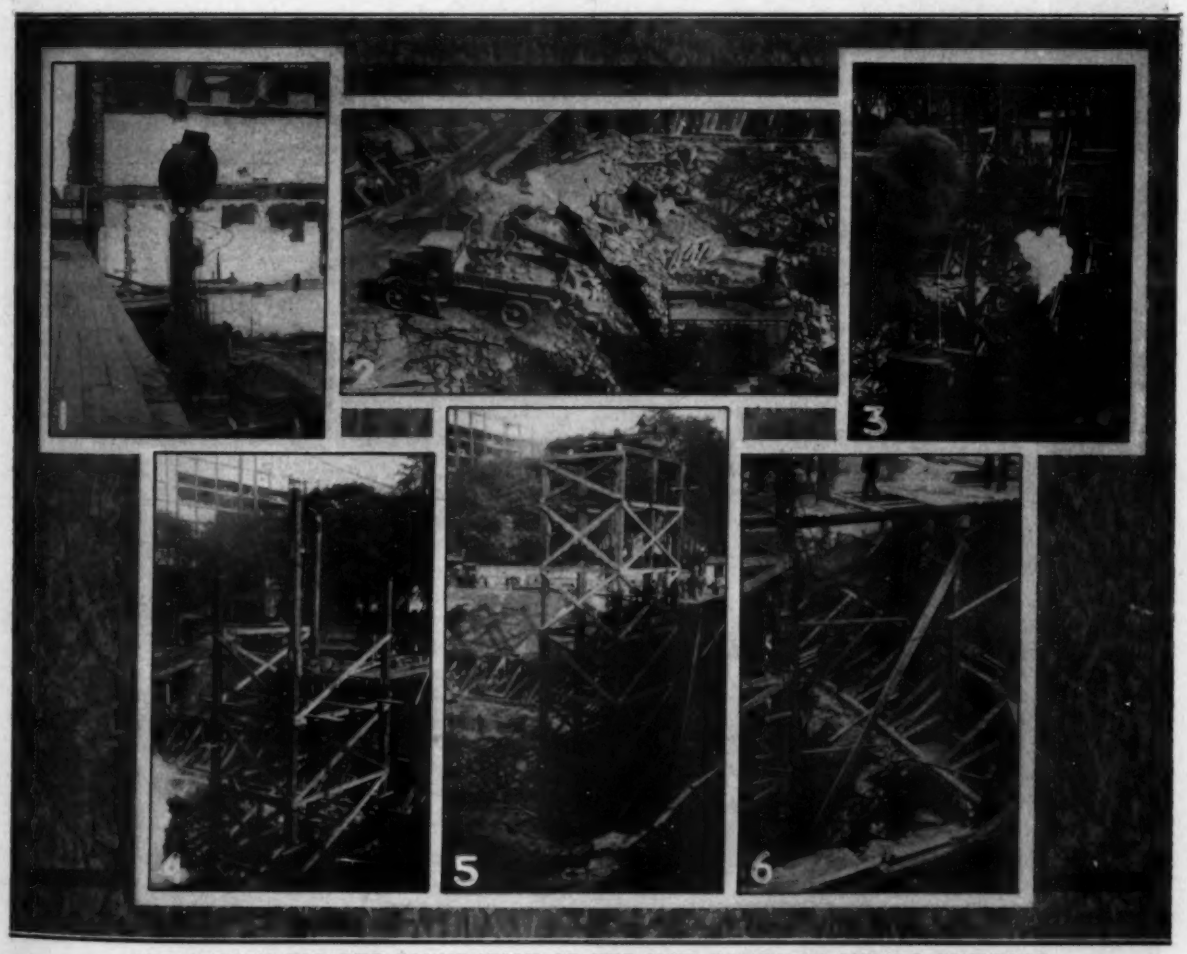
Construction Manager, George A. Fuller Co. of Canada, Ltd.

THE hub of Montreal is the corner of Peel and Ste. Catherine Streets. At the southwest corner of this junction on a plot of land measuring 238 feet, 6 inches, by 170 feet, surrounded by Ste. Catherine, Peel and Metcalf Streets and Park Place, the Dominion Square Building now stands, a monument to good design and careful construction. With five stories below the ground, the structure is considerably greater than is at first apparent. The gross floor area is approximately 550,000 square feet and the volume nearly 7,000,000 cubic feet.

The five stories below ground provide space for a garage capable of accommodating 600 cars. The garage area consists of approximately one-half the basement and all of the sub-basements, except for that portion in the third sub-basement which is occupied by the boilers, pumps and other items of mechanical equipment located in the boiler room floor 18 feet below.

General Construction

The foundations of the building are all in solid rock, excavation having been carried more than 26 feet into



EXCAVATION FOR THE FOUNDATION OF THE NEW DOMINION SQUARE BUILDING

1. One of the ten 500-watt floodlights for night work. 2. A Bucyrus-Erie B-2 shovel loading one of the trucks at the foot of the ramp. Note the high lift. 3. Cleaning up at the base of the truck elevator, which is shown under construction. 4. Rigger getting into place. 5. The elevator complete. 6. Detail of bracing for runway to elevator

The Excavation of Section A on October 15, 1928, Showing the Method Used to Hold the Bank Left After Excavation

rock. The foundation walls are all of reinforced concrete, 24 inches thick at the bottom and 14 inches thick at the top with piers to carry the wall columns which rest on the foundation walls at grade. The walls are all integrally waterproofed and, where required, have, in addition, a waterproof coating of hydrolithic cement.

The framework is of structural steel fireproofed with concrete, except at the exterior walls where brick and terra cotta fireproofing is used. The floor arches are of concrete, joist type, with cement finish floors over the entire office area.

The exterior walls are of Rockwood stone backed with terra cotta backup tile and brick. The exterior windows for the ground floor stores are ornamental cast iron and Zouri copper store front construction.

CONSTRUCTION BEGUN IN 1928

From the beginning speed of construction has been of paramount importance and, for this reason, work has been carried on practically continuously on a two-shift basis, except during January and February, 1929, when three-shifts were used. Although the contract was let in April, 1928, the whole area of the site was not available at that time. Due to existing long-term lease, the premises on the corner of Metcalfe and Ste. Catherine Streets occupied by a bank could not be demolished until May 1, 1929. The adjoining stories to a distance of 70 feet west from Metcalf Street were not vacant until November 1, 1928. This made it necessary to schedule the construction of the building in two sections, the first section comprising roughly 65 per cent of the plan area to be completed in the fall of 1929 and the balance in the spring of 1930.

The entire garage area with the exception of the corner underlying the bank site was scheduled for completion June 15, 1929 and this schedule was adhered to. The garage opened its doors for business on July 1, 1929, and is now operating over the entire site including the portion under the bank site. The completion dates for the balance of the two sections of the building have been altered to some extent due to various considerations. Section A will not be completed very much in advance of Section B and all rented portions in both sections should be finished before the end of 1929. Some of the shops were occupied in August and office space on the lower floors of section A was ready about the same time.

Wrecking was commenced early in July and on August 7, 1928, Kendall Brothers, Ltd., Montreal, who had the excavation and haulage sub-contract, placed the first steam shovel at work. Rock level over the site averaged about 24 feet below grade and overlying this was soft clay and sand. Bad water conditions were also encountered in a few isolated spots. As the depth of excavation was 46 feet below grade and 64 feet below grade at the boiler rooms, it can readily be seen that to maintain the streets undisturbed during this deep rock excavation constituted a problem of major importance.

EXCAVATION METHODS

The method adopted by the contractor had not been used before in Montreal, but proved entirely successful as there was absolutely no movement whatever in the surrounding street. First, the earth excavation was taken out by two Bucyrus-Erie steam shovels, leaving a bank of about 1 to 1 slope all around the hole. A vertical row of sheeting was then set about 8 feet up from the toe of the slope to take care of soft clay and this was securely braced to the solid rock. All this bracing, confined to the outside bay of the building, was left undisturbed until the central portion of the building was excavated. The sloping banks were protected by tarpaulins to prevent softening and possible sliding under the influence of rain.

Next, the steel framing was erected and the concrete column fireproofing and floor arches poured. When this concrete work was properly set, wood sheet piling was driven outside the building line and securely braced to the framework of the building, thus holding the banks safe while the clay and rock berms were removed and the foundation walls brought up to grade. In order to protect these walls against water pressure, the steel beams were placed and concrete arches poured at each floor level as the walls were brought up. It was not possible to take trucks in and out of the hole by means of ramps after the first stripping operations were completed as the ramp would have interfered with the method of conducting operations as outlined above. A hoist truck or elevator was, therefore, installed capable of handling a fully loaded 5-ton truck. The accompanying illustrations show very clearly the various points outlined.

SPEED OF EXCAVATION

The rapidity with which the rock was removed can be gaged by the following figures. The total rock removed was 38,000 cubic yards, the best daily production 700 cubic yards, and the best monthly production 12,000 cubic yards. In addition to this rock excavation, there was about 32,000 cubic yards of clay, a good part of which was taken out with the rock.

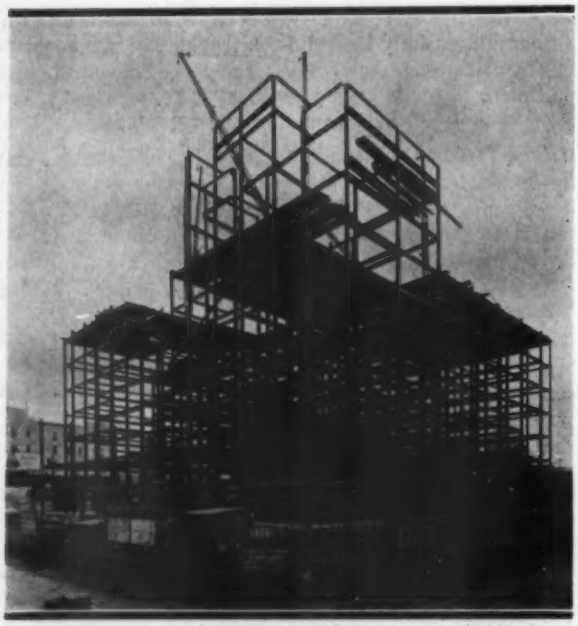
WINTER CONCRETING

The structural steel core below grade for Section A was erected in November so that the concrete floor slabs and foundation walls for this section had to be poured during the coldest months, December, January and February. In order to insure rapid setting and early high strength, every possible precaution was taken. Calcium chloride, heating of materials, protection by tarpaulins, and heating with salamanders were all used and no trouble from frozen concrete was encountered.

STEEL ERECTION

By March 1, 1929, Section A was completed to grade and the Dominion Bridge Co., proceeded to erect the steel framework for that portion of the building at the rate of about three floors per week.

General View of the Job in February, 1929, Showing the Bank Braced Near the Central Part of the Section While the Berms of Rock Were Excavated



General View of the Steel Work on April 16, 1929

STONE WORK

The concrete framework and fireproofing followed as closely as possible, thus permitting a start to be made with the setting of stone early in April. The stone was supplied by the Ritchie Cut Stone Co. of Hamilton, and in order to insure rapid erection of the stone work, a yard was established in Montreal, in which the stone was sorted and stored as fast as it was cut during the month preceding the erection. In this yard a shed was erected and fitted up for the use of the stone carvers. All carving was done in Montreal to permit direct supervision by the architects. Most of this work was done before the stone was set.

In order to facilitate handling of the stone at the job, special skip boxes were built for use in transporting the stone from the yard. Stones for any given section were selected at the yard and loaded in skips. The boxes were then lifted onto a truck and taken to the building, three boxes making a full load. Here they were hoisted to wherever the stone was required, unloaded and the empty boxes returned to the yard. This method reduced the number of times each stone had to be handled and thus speeded up the work. It also considerably lowered the cost of trucking by cutting down the time usually required for loading and unloading.

A View of the Completed Portion of the Building on July 3, 1929, Showing the Park and Peel Street Facades

SPECIAL WORK

In order to make possible the opening of the garage at the required time, the Park place elevation was pushed to completion somewhat ahead of the other walls and all stone setting on this face of Section A was finished by June 15. This made it possible to open up Park Place between Peel Street and the garage entrance without danger to passersby from workmen overhead.

While Section A was thus proceeding, Section B was also going ahead. In order to expedite the work held up at the corner of Ste. Catherine and Metcalfe Streets by the bank lease, a false roof was placed over the bank premises and the building wrecked down to the second story during the winter. Thus, when the bank premises were vacated during the last week of April, only ten days were required to complete the wrecking of the building.

It was considered essential that all blasting should be completed before the garage opened, so this corner was pushed in every way possible with the result that foundation walls, steel framing, floor arches and finish were all completed by July 1.

CONCLUSION

While high speed construction is now accepted practice, the rapid progress on this building is noteworthy. When all the various circumstances as outlined in this article are taken into consideration, it is clear that a record has been set up which will be difficult to best and of which all those who have shared in the work may well be proud.

The architects for the Dominion Square Building were Ross and MacDonald of Montreal and the general contractor, the George A. Fuller Co., of Canada, Ltd., of Montreal and Toronto.

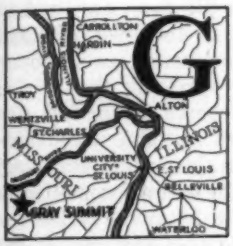
A Large Ready-Mixed Concrete Plant in St. Paul

WITH a capacity of 1,000 cubic yards daily, enough to pave a street 118 feet wide, 6 inches thick and 6 blocks in length, the Guaranteed Concrete Co., 1089 North Snelling Ave., St. Paul, has started business with an investment of $100,000 in its plant in a city with a population of 300,000. The ready-mixed concrete is carried in a hermetically sealed revolving steel drum having a capacity of about 3 cubic yards. Constant slow revolution of the drum during transit prevents any tendency to segregate and insures a complete hydration. Ready-mixed concrete has been hauled for more than three hours with no depreciation in loss or workability or strength. The patented bodies are dumped by St. Paul hoists.

The Guaranteed Concrete Co.'s price on ready-mixed concrete varies slightly with the cost of labor and materials. The present average downtown price where the haul is less than 3 miles is $6.50 per cubic yard.

Tunneling Methods on the Missouri-Pacific

Extensive Project Between Allenton and Boles, Mo., Includes Two Tunnels With Long Approaches Being Driven By J. A. Kreis & Sons

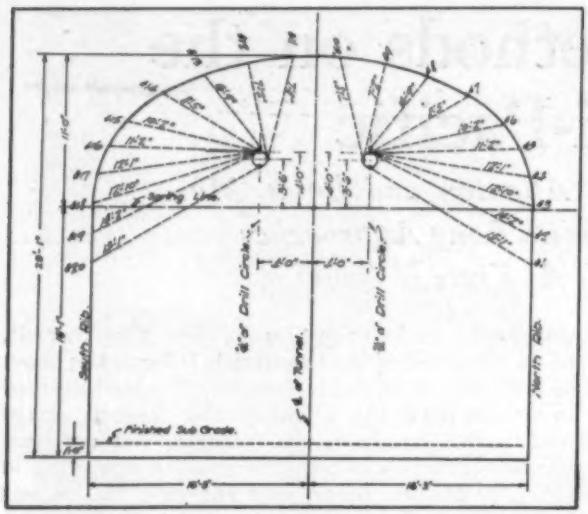


GRADE elimination is the cry of the heavy hauling railroads today to make possible the handling of heavier trains with the same equipment and much larger trains with the new locomotives now being developed. As a part of its program the Missouri-Pacific awarded a large contract between Allenton and Boles, Mo., for grading the Pacific yards, a long cut, and two tunnels known as the Gray Summit and Labadie tunnels. The Gray Summit tunnel is 1,600 feet in length, and the Labadie tunnel 550 feet. This section of the railroad is also being double-tracked as part of the program to double-track the line from Jefferson City to St. Louis. The work is already completed from Jefferson City to Boles. Gray Summit, where the larger of the two tunnels is located, is about 40 miles west of St. Louis by motor. The methods used in the two tunnels were substantially the same, except that in the Labadie tunnel timbering was necessary throughout because of the softness of the rock, while in the Gray Summit tunnel only one short section was timbered near the east portal.

Approaches

The east approach of the Gray Summit tunnel is an open cut about 5,000 feet long, with a maximum depth at the portal face of 96 feet, and an average width at the top of about 100 feet and a subgrade width of 45 feet. The west approach is about 3,900 feet long, and has a maximum depth of 80 feet, and an average width of 90 feet at the top and a subgrade width of 43 feet.

The East Portal of the Gray Summit Tunnel with Superintendent M. P. Smith of J. A. Kreis & Sons in the Foreground



The Drilling Diagram Used in Driving the Gray Summit Tunnel

THE PIONEER TUNNEL

A pioneer or center tunnel was driven through ahead of the main tunneling operations. The pioneer tunnel was 7 feet high and 12 feet wide, while the full tunnel as completed with concrete lining for double-track operation will be 29 feet wide and 28 feet high. On the pioneer tunnel 2 drillers and 2 helpers were used per shift. The operations on the entire job are carried on 24 hours a day. Mucking in the pioneer tunnel was by hand, the muck being taken out by mule-drawn muck cars and a hoisting engine.

ENLARGING THE TUNNEL

As rapidly as the pioneer tunnel was driven ahead, and each noon or midnight lunch hour the Missouri-Pacific engineers checked the line and painted the center line of the tunnel section on the rock at the top. From this center line a distance of 4 feet to the side and 3 feet 6 inches from the floor was measured as the location for the protractor which guided the drillers making the holes for the full size tunnel. The accompanying drilling diagram shows the angles and distances drilled.

The drilling crew consisted of drifters, one on either side, 3 jackhammer men drilling vertically and one helper for each drifter. With this crew it was possible to drill and shoot two rings of 4½ feet each per 10-hour shift, or a progress of 18 feet per 24 hours.

MUCKING

A Marion 41 air shovel loaded the 12-yard Western dump cars from the face. The pit crew consisted of 6 pit men at the shovel, 1 man at the Ingersoll-Rand portable compressor in the tunnel acting as a booster on the 3-inch air line, 1 man operating the Marion shovel and one craneman, 1 switchman for the full gage track, 1 man on the Plymouth gasoline locomotive which hauled the 8 12-yard car trains in the tunnel and moved them out to the American steam locomotive in the cut, which hauled the train to fill at the end of the cut. One man was also used to spot the cars at the shovel.

The usual method of handling the track was used with the switch maintained a sufficient distance behind the shovel to permit the full cars to be run out on the switch and then made up into a train when the full number was loaded.

MACHINE SHOP

A very complete machine shop in a standard gage railway car was maintained with lathes, grinders and other small power tools operated from a jackshaft run by a General Electric motor.

COMPRESSOR EQUIPMENT

The compressor house was located on top of the hill about midway between the two portals, and supplied air for the entire job, amounting to as many as 25 drills at one time. The equipment included 3 Type WJ3 Sullivan 16 x 9¾ x 10 air compressors, with a capacity

The Machine and Repair Shops of J. A. Kreis & Sons Near the Gray Summit Station of the Missouri-Pacific

of about 750 cubic feet per minute each. A 6-inch air line was run to each of the portals. The compressors were run by 2,300-volt General Electric synchronous motors, and the switching equipment throughout is General Electric make.

BLACKSMITH SHOP

A blacksmith shop for general repairs, equipped with 2 coal forges, a welding outfit and an Ingersoll-Rand oil forge for the drill steel and a pneumatic sharpener of the same make, handles all the work of this nature about the job. One man sharpens all the drill steel for both inside and outside drilling and looks after the 25 drills on a 10-hour shift.

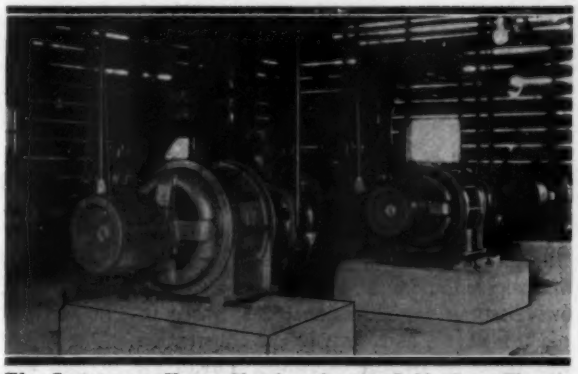
TRIMMING SLOPE IN CUT

In one or two places where the stratified limestone which makes up the bulk of the stone in the tunnel operations was not broken back as far as the slope line in the cut, a crew was put in to trim it up. This crew consisted of 3 drillers and 2 men loading holes and shooting. There were 4 pit men for the Marion 60 steam shovel, and the shovel crew of 3 men loading material shot from the slope into standard gage trains made up of 10 Western 12-yard dump cars and Baldwin switching type locomotives.

CONCRETING PLANT

The tunnel is to be lined throughout with concrete, and will have a smoke plate the entire length of both tracks. The cement and the aggregates and reinforcing steel are all furnished to the contractor by the railroad.

The concrete plant was served by a trestle from which all the sand and gravel was dumped into Heltzel bins and batchers. A Koehring 6-bag mixer was used to mix the concrete for delivery to the Blaw-Knox steel forms. A Ransome pneumatic placing gun was used for placing concrete above the spring line.



The Compressor House Showing the 710-Cubic Foot Electrically Driven Sullivan Compressors

PERSONNEL

Between 175 and 200 men were maintained in a well-kept construction camp on a hill overlooking the east portal. Another 100 men lived in private homes in the small town. J. A. Kreis & Sons, Knoxville, Tenn., were the contractors for the entire 16.8-mile section, tunnels included. J. E. Kreis, Vice-President, was in charge of the work for the contractor, with M. P. Smith as Superintendent on Gray Summit tunnel operations, and T. O. Hudson as Superintendent of Labadie tunnel operations. For the Missouri-Pacific, E. A. Hadley is Chief Engineer; C. S. Sample, Engineer of Construction, and E. L. Freeland, Assistant Engineer in charge of the Gray Summit tunnel section.

Paving the Slope of a Sand-Fill Bridge Approach

Geo. W. Katterjohn & Son, Paducah, Ky., Contractors, Pour 17,500 Square Yards on Slope in 36 Working Days

IN order to protect the sand-fill approach to the new Paducah-Ohio River bridge from erosion, caused by either high water in the river or heavy rains, 17,500 square yards of 1:3:5 mix concrete slab 4 inches thick has been placed both upstream and downstream to cover the slope. This bridge is an attractive 9-span structure across the Ohio River from Paducah to Southern Illinois, and forms the main connecting link for travel from the Great Lakes and all points north to the Gulf of Mexico and the entire South. The 1,500-foot sand fill is on the Kentucky approach, and was pumped into place from the river.

Heltzel sidewalk forms were used in pouring the slabs. These were set 7 feet apart on the slope, just as they would be used for sidewalk work on level ground, with templates or division plates and stiffeners hooked onto the forms to hold them rigid. A 7-foot space was left between pairs of forms when they were set up so that the slabs were poured in alternate 7-foot sections. Electrically-welded galvanized American Steel & Wire Co. steel mesh, with a 6 x 12-inch web was used in the center of the slab. The mesh was picked up by hooks as the concrete was poured to center it in the slab. It was poured on a slope which varied from 1 to 1 to 2 to 1. The sidewalk forms used were purchased 12 years ago and have been in constant use.

WATER SUPPLY

The sand subgrade was kept wet down at all times during the progress of the work, which kept it in per-

fect condition for pouring. A Domestic force pump was used to deliver water from the Ohio River through 2,000 feet of pipe line to supply the two concrete mixers and for wetting down the subgrade and sprinkling for curing.

Two men set all the steel forms for the job, which kept the two non-tilting 10-S Jaeger mixers operating. Each mixer had a crew of ten men, while five men carried forms ahead and graded out just prior to pouring. The total crew on the job was 27 men, one foreman and one superintendent. The mixers were equipped with a swivel spout, which connected to three 10-foot sections of steel chute, as shown in the illustration. The mixer was powered with a 4-cylinder LeRoi motor, and was mounted on rubber-tired disc wheels, making it easy to move the machine along the subgrade as work progressed. Washed Ohio River sand and gravel from local sources was used with Atlas Portland cement throughout the work.

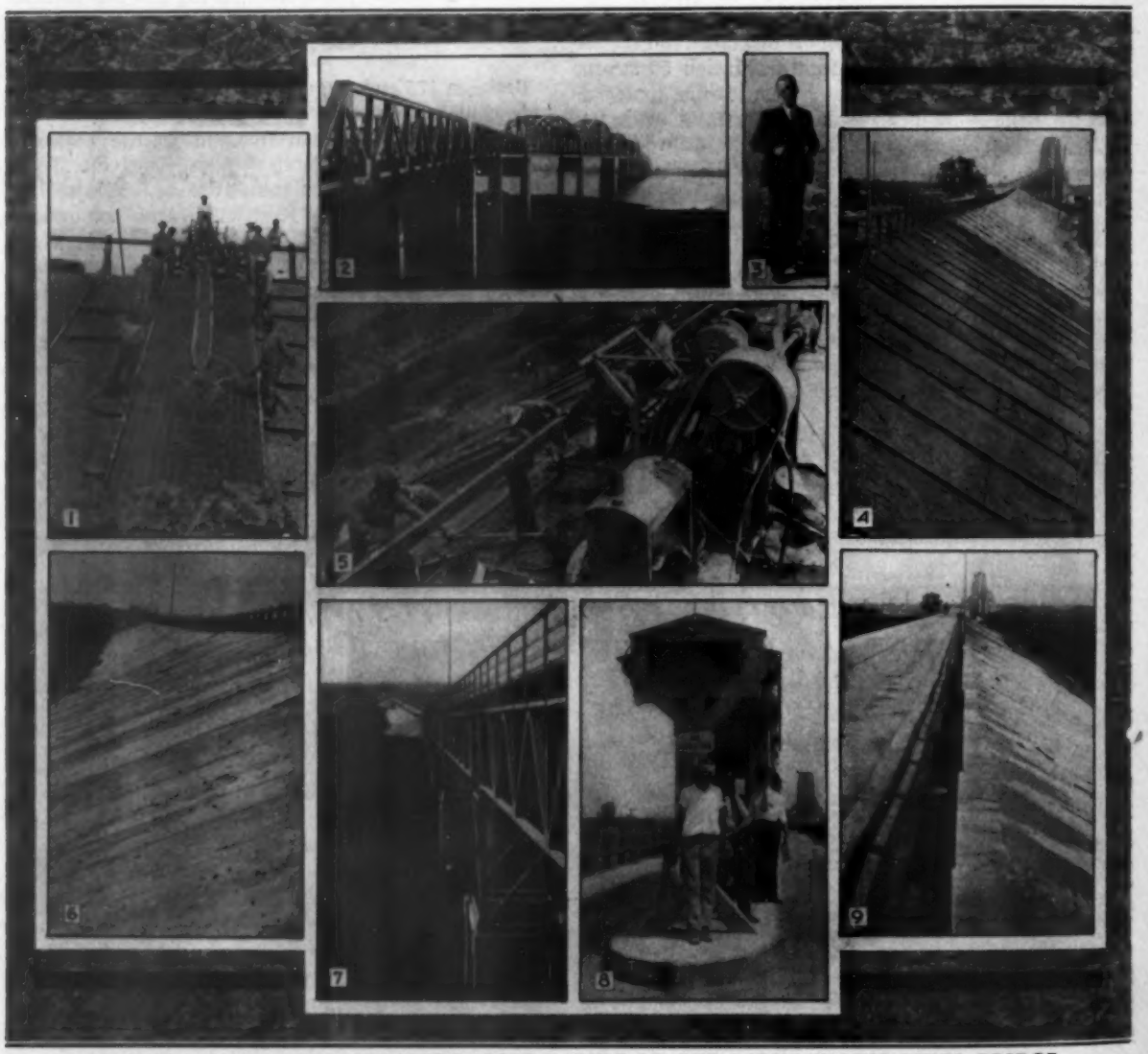
TOE WALL PAVED WITH SLAB

As the work went on, a concrete wall 3 feet deep and 1 foot thick was poured as a monolith at the bottom of the slab to keep high water currents from cutting under the side slope paving.

At the top of the slope where the sloping slab met the pavement, the guard rail posts were imbedded in place and the side slope continued onto the shoulder. Thus the entire sand fill was completely encased upstream and downstream, as well as on top.

PERSONNEL

The contract for this project was awarded to Geo. W. Katterjohn & Son, Paducah, Ky., and Geo. W. Katterjohn, Jr., acted as Superintendent on the project.

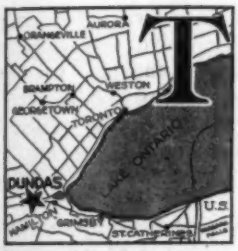


CONSTRUCTION OF THE CONCRETE SLOPE PAVING OF THE PADUCAH-OHIO RIVER BRIDGE

1. One of the concreting crews, showing two 10-foot chutes being used to deliver concrete to the lower part of the slope. 2. A view of the river spans of the bridge. 3. Geo. W. Katterjohn, Jr. 4. A section of the paving showing the Heltzel steel sidewalk forms and stiffeners and the placing of the web reinforcing. 5. Preparing to pour at the top of the slope. 6. The completed paving before it was cleaned. 7. The paved upstream slope as seen from the bridge. 8. The toll booth, showing one concreting crew working in the right background. 9. Detail showing where road and slope paving met, encasing the guard rail posts.

Fighting Snow to Lay Hot Mix Pavement

Six Inches of Snow, a 6½-Mile Dead Haul Up a Hill, Two Complete Shifts of Equipment in One Day Made Dundas, Ont., Job a Tartar



THE Rayner Construction Co. of Toronto, Ont., took the contract for the construction of 4.6 miles of asphaltic concrete pavement on the Dundas Highway from Clappison Corners to the Gaetult-Hamilton highway last October and started work on November 1, 1928.

On December 15 a 2,400-foot stretch of base course from B was finished and the rollers and road crew moved to A and in the afternoon of the same day laid 900 feet of base. On December 18 the three rollers and crew were returned to B to lay top. About 6 o'clock in the evening of December 17 it had started to snow and did not quit until 3.30 A. M. December 18. By 5 o'clock that morning 200 feet of road had been cleared ready to lay the hot mix top. The road crews used power graders, hand shoveling, power and hand sweeping, steaming, fires of straw, fuel oil and gasoline to remove the snow so that work could be continued.

With the temperature around zero the crews laid around 597 tons of hot mix that day and completed the job at 7 P. M. December 21 immediately after which T. B. Woodyatt, Superintendent, called up George Rayner, General Manager of the company in Toronto and reported that he had run out of road. General jubilation was in order as another storm like that of December 17 would have closed down the job for three or four months.

At one time on this job there were 15 trucks in the ditch, but by the use of the Cletrac 30-horsepower tractor and a liberal supply of telegraph poles, block and tackle, they were pulled out one at a time.

Location of Laying Changed With Plant In Full Operation

When the big rush of December 18 was under way it was necessary to do some tall planning to get the rollers to the new location ahead of time and to see that there were men there also ahead of the first batch. When the shift was made on the fifteenth the mixing plant was stopped but they never knew when the shift was made on the eighteenth and kept right on delivering the batches with their usual regularity.

When the second move was made a traffic man was stationed at C and as soon as the required number of truckloads of hot mix under tarpaulin covers had gone by the corners to finish the work at A he directed the trucks to turn right and go to B. Two hours before this the first roller was started out from A to be ready for the rolling at B and just as the first truck was diverted toward B another truck with one half of the road crew was started from A and raced the batch trucks to B arriving just a minute ahead.

During this time the plant was running full blast and the string of trucks were pulling up the long grade 1⅜ miles of which had to be made in low gear making the distance in 21 minutes.

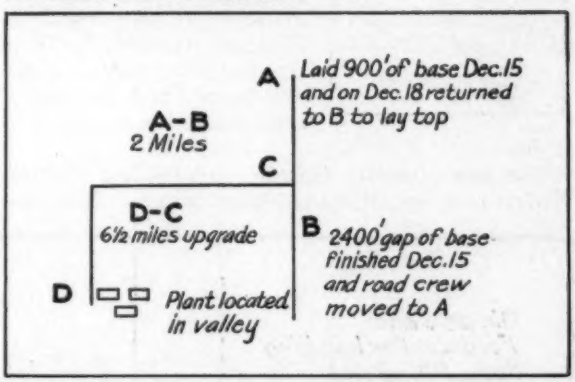

A
Laid 900' of base Dec. 15 and on Dec. 18 returned to B to lay top
A-B
2 Miles
C
D-C
6½ miles upgrade
B
2400' gap of base finished Dec. 15 and road crew moved to A
D
Plant located in valley

Diagram Showing Locations of Work and Plant

This is the story of the triumph of mind over matter and the Superintendent is to be congratulated in the handling of the emergency operation. The work brought special commendation from the Ontario Department of Public Roads shortly after it was completed. A large part of the work on this contract was done under acetylene flares, otherwise it would have been practically impossible to complete the work before the weather would have been so bad as to make hot mix work impossible.

The Right of the Public to Detour on Private Land

ACCORDING to a recent opinion of J. E. Markham, Assistant Attorney General of Minnesota, if a public highway is out of repair and impassable, a traveler may lawfully go over the adjoining land without being guilty of trespass. Mr. Markham states, "This right of diversion is based upon the maxim that private mischief shall be endured rather than public inconvenience and on the ground that it is for the public good that there should be at all times free passage along the highways for all subjects of the state."

A decision by the Court of Appeals of West Virginia states the law concisely as follows: "It is well also to note that in addition to all the public roads, he may under certain circumstances rightfully pass over private property. If, in traveling upon a highway, he finds it obviously dangerous at any point, he may pass around such a place over adjacent private property and even remove fences and destroy crops in doing so, provided he does not deviate farther from the road not to do more injury to the private premises than is actually necessary and no other reasonably convenient public way is available."

This is a very interesting decision, but it should be noted by contractors that this does not refer to or create a privilege for the use of private property by travelers or others where a road is under construction and proper detours have been provided by the state.

Concrete Handling on 4,800-Foot Viaduct

New Concrete Structure and Earth Embankment Replaces Old Wooden Harahan Viaduct in Arkansas Opposite Memphis

RECONSTRUCTION and relocation of the old Harahan Viaduct which has served traffic in Arkansas for many years is now a reality. The old structure was difficult to maintain particularly with the increasing heavy traffic west-bound, and the timber bents made depreciation very rapid.

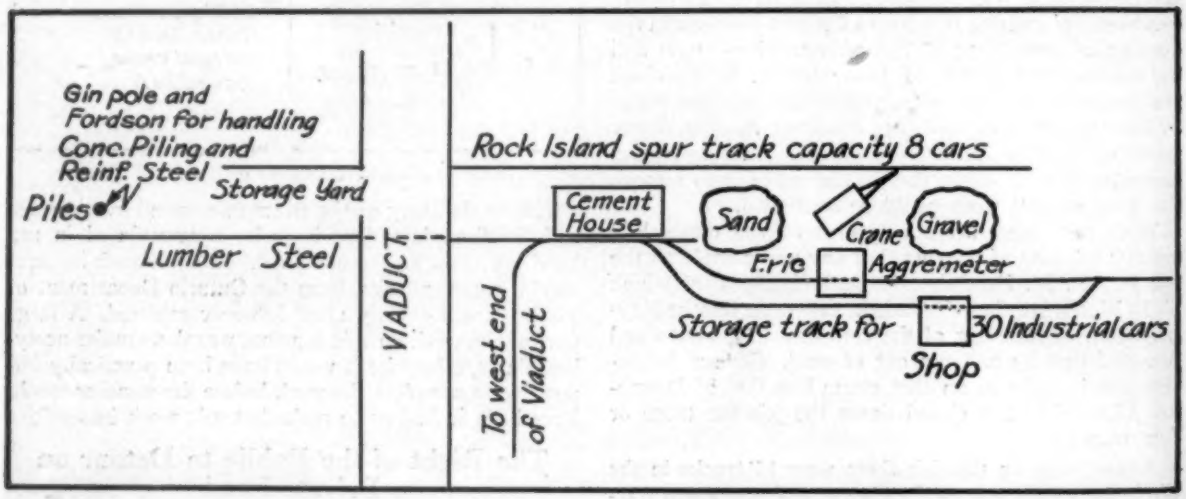
The new structure includes one 534-foot concrete viaduct near the Mississippi River bridge at Memphis, an 80-foot bridge across the Rock Island Railroad tracks and a 3,498-foot viaduct with a maximum height of 65 feet at the second railroad crossing where a 65-foot skew span was built. The Fuller Construction Co., Dallas, Texas, was awarded the contract for the construction of the concrete sections of this project for $870,000. The contract was awarded in November, 1927, the plans then somewhat changed so that the start of the work was delayed until January, 1928. Work on the superstructure was started in August, 1928, and would have been completed early in the summer of 1929 but for the continuance of high water in the Mississippi River which closed all work for a period of about 100 days. The viaduct was completed August 17, 1929.

Plan of Construction

Work on the 4,000-foot section which is typical of the methods used on the other two sections with the addition of special methods made necessary by the added height to the longest section, included driving concrete piling foundations using 26 to 45-foot piles driven to 4 feet below ground level in the dry. On top of these piles the concrete footings were poured using a 1:2:4 mix. The same mix was used on the columns and caps, while the superstructure was a 1:2:3 mix.

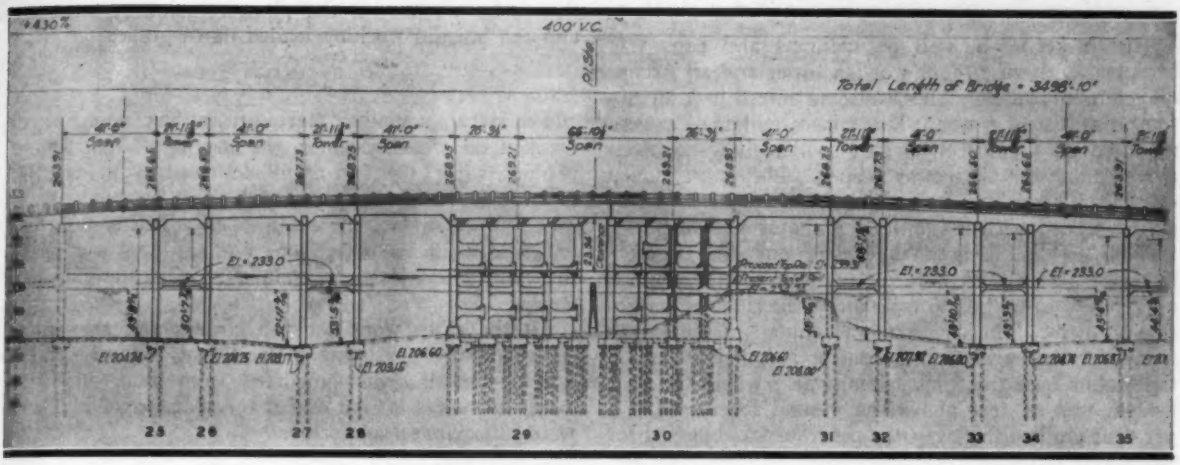
The Material Yard and Batching Plant

The material yard was located near the center of the job where a spur of the Rock Island went under one of the bridges to the Mississippi River Commission plant about a mile below. An industrial railway track was laid parallelling the spur so that materials could be unloaded from the freight cars direct to industrial equipment as needed. On the north side of the new concrete bridge the stock piles of piles, lumber and steel were located and the cement house immediately to the south of the bridge. Between the bridge and the cement house an extension of the main line of the industrial track permitted cement to be unloaded direct from the cars to the batch bodies on the Koppel cars.



Layout of Material Handling Plant for Harahan Viaduct

To the south of the 20 x 40-foot cement house was the sand stockpile, then the Orton crane, with the Erie Aggremeters back from it and so arranged that the industrial track ran beneath it, and to the south again, the gravel stock pile. The track ran for about 100 feet beyond the batchers and a spur from the south end of the cement house ran out with storage space for about 30 cars. This spur connected again with the main track at the end of the line. A total of 2 miles of industrial track was used on this job to serve two of the concrete structures. Added length of track set was made necessary by the large borrow pits for the earth embank-



Elevation of the Harahan Viaduct

ments which were built by dragline under another contract. A total of 2,000 feet of trestle was also necessary in three sections to get over bad areas of swamp and for certain crossings which could not be handled in any other way.

Trains of 10 to 12 cars hauled by 3½-ton Whitcomb locomotives with specially built batch boxes of 4 compartments per car were used. The batch boxes designed by the superintendent on the job were ingenious. Each of the compartments had a bottom on a 40-degree slope so that the batch would slide out quickly when the side doors were opened. The compartments were 4 feet high, 4 feet wide across the cars and each box 1 foot wide along the car. The size of the compartment was so designed that no matter whether a 1:2:4 or a 1:2:3 mix was used one compartment would hold a batch for the Jaeger 10-S mixer and two compartments would hold sufficient for a batch for the Ransome 21-S mixer. The compartments dumped directly into the mixer skips which were lowered below ground level.

POURING THE FOOTINGS AND COLUMNS

As soon as the piles were driven the footings were poured with the Jaeger mixer which was moved along the work as needed on trucks. The columns were similarly handled except that the Jaeger 10-S mixer was then brought in and an 80-foot wooden tower was used with chutes for the pouring of the columns.

CASTING THE RAILING AND POSTS ON THE FLOOR SLAB

1. Making up the forms for the guard rail using planks with strips nailed on to give the bevels. 2. The entire casting plant on the viaduct floor. 3. Method of supporting the forms for the posts with the rails set into the forms. 4. The completed guard fence.

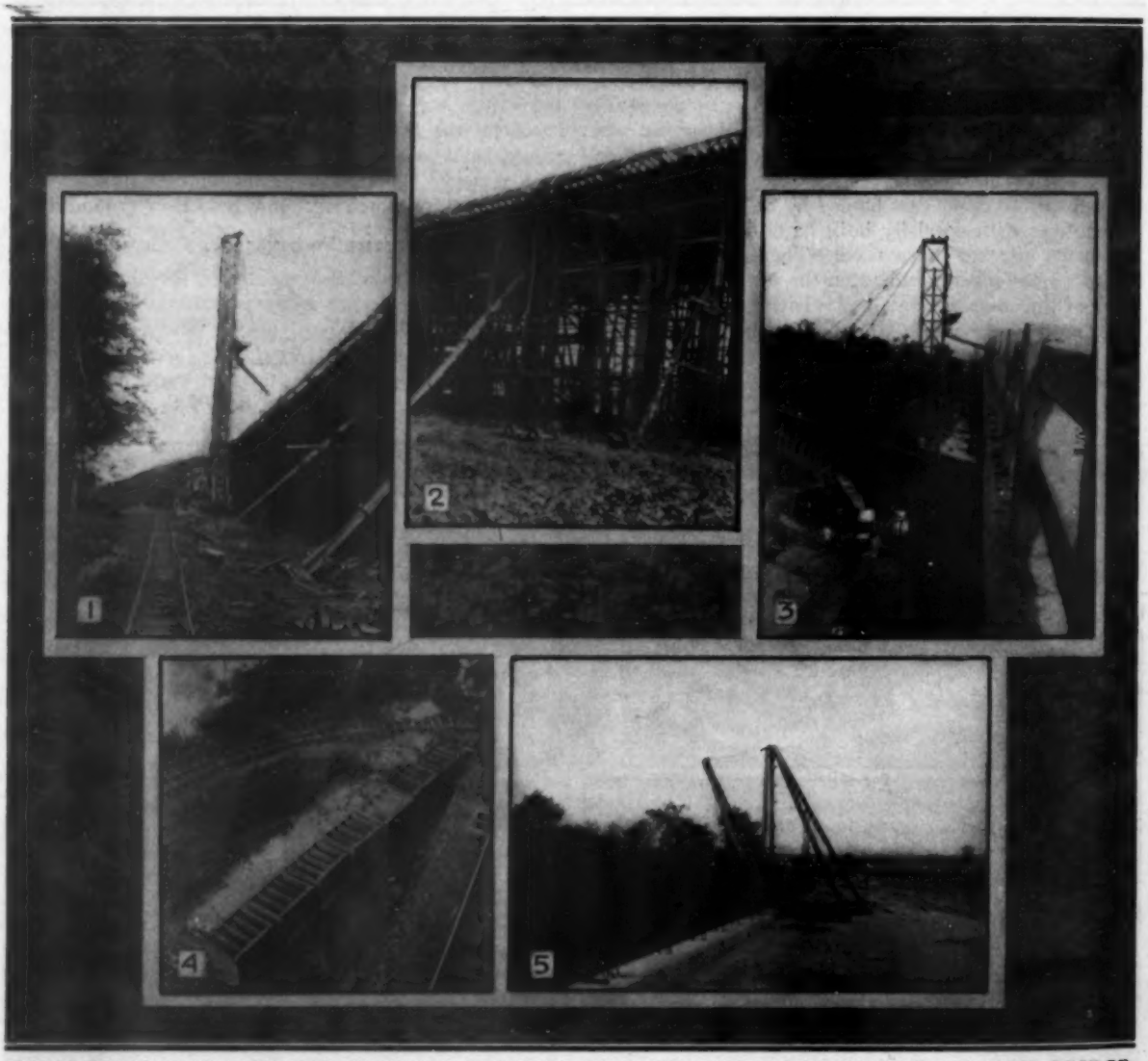
Novel Rigging of Mixers for Pouring

The Jaeger 10-S used on columns and caps was equipped with an 80-foot wooden tower and an Archer hopper and chutes. The Ransome mixer had an 80-foot Insley steel tower. The mixers and towers were mounted on 4 old Koppel cars so that they could be moved along the viaduct as needed. They were moved over 1 mile without any trouble. The Jaeger outfit was equipped with a Continental motor with a power take-off to handle both the mixer and the concrete bucket. The towers were guyed back to the columns and girders as well as to trees along the right of way to steady them. The concrete was chuted direct to the forms for the superstructure as far as possible but on the section over the Rock Island tracks where the floor system was 65 feet above the ground level with a 4 per cent grade either way the concrete was buggied for the entire work with the plant remaining stationary and the buggies working loaded down grade.

Design

The Harahan Viaduct started from the concrete pavement at the westerly end of the existing 16-foot timber viaduct, with 1,098 feet of fill, followed by Bridge No. 1, 3,498 feet and 10 inches long. East of this was another fill 3,518 feet in length, then a bridge 805 feet long and a fill 3,335 feet long and the final section of the viaduct 534 feet long connecting with the Harahan Bridge.

All the form work for the girders and the entire superstructure consisting of a 40-foot roadway and a 5-foot sidewalk, was supported from mud sills with complete success as not one of the spans sagged. There were 130 spans so supported.



CONCRETING PLANT AND FORMS ON THE HARAHAN VIADUCT LEADING FROM THE MEMPHIS BRIDGE INTO ARKANSAS

1. Jaeger mixer and Archer tower which were used to pour a portion of the floor system. 2. The falsework for the floor which was all carried on mud sills without any sag in the forms when poured. 3. Ransome mixer with Insley tower which was skidded along the viaduct to pour the floor. 4. Train of batch cars made specially to dump directly into the mixer skip which was dropped below ground level. 5. Stiff leg derrick used with a Fordson tractor to hoist all reinforcement and lumber to the floor slab from the industrial railway below.

CONCRETE RAILING CAST ON THE JOB

The viaduct has a concrete railing for the entire length composed of 2 precast rails and cast-in-place posts. The rails were cast in oiled forms with removable partitions on the floor slab of the viaduct and measured 4 x 8 inches with a small bevel on the top and bottom. They were cast so as to fit into the posts which were 10 x 10 inches and 7 feet center to center. The ends of alternate rails were wrapped with tar paper to permit them to expand and contract without disturbing the posts. The posts as cast on the bridge were remarkably true to line.

PUMPING EQUIPMENT

In order to permit work on the footings in the dry an American-Marsh 6-inch centrifugal pump was used to unwater the excavation. To supply water for the 2 mixers, two Myers Bulldozer plunger pumps and one Barnes pump were used.

PERSONNEL

The contract for the concrete work on this viaduct was awarded to the Fuller Construction Co., Dallas, Texas, for which G. W. Courter is Chief Engineer and H. R. Hays is Superintendent. For the State Highway Commission Roy B. Leighton was Resident Engineer, and H. P. Knight, Assistant Resident Engineer.

Why Do General Contractors Avoid Municipal Work in Greater New York?

RELUCTANCE on the part of some general and subcontractors who are the leaders in their various lines to bid on municipal work in New York City, has caused the Credit Association of the Building Trades of New York to make inquiries among its members in an effort to ascertain the reason for this attitude. The results so far show that there are various causes for this aversion and that the municipality is not as much to blame as are the conditions of the contracts under which estimates are asked or the demands and practices made by general contractors in dealing with their subcontractors.

Some few years ago W. H. Gompert, then Superintendent of Building for the Public Schools in New York, sent out a plea to the old line contractors in Manhattan to bid on the Board of Education's vast program for new schools. In two instances, he was successful in having his solicitation answered, with the result that two of the best general contractors in the country secured contracts.

At that time a canvass was made to ascertain why public school contracts were unpopular among the higher class builders. They invariably replied that the terms of the contract permitted of too many bosses, owing to the existing laws which permit the heating and ventilating and electrical contracts to be let separately. This condition holds good today, so that, instead of the general contractor being personally responsible for the entire job, he has no jurisdiction over the associated contractors. Friction is unavoidable where authority is divided. On the other hand, the heating and ventilating and electrical firms prefer to do business direct with the city instead of relying for payment on the general contractor and, therefore, they fight any change in conditions.

Another generally understood reason why some declare that working for the city is not satisfactory is that they do not know whether to blame the city or the city's intermediary, the individual or firm to whom the general contract is let for the various situations that arise from time to time and result in differences and in many cases, deferred payment.

It has been reported to the Credit Association of the Building Trades of New York that one city contractor put a clause or clauses in his agreement with the sub-contractor relieving him, the general contractor, of all responsibility for payments until he is paid by the municipality. These clauses are so worded that if there was trouble on an operation and a contractor was discharged, and there was no money left at the time of his discharge for the completion of the project or other money available, there would be no financial recovery possible by the subcontractor in the event he had money due, even though the city contractor might have money of his own in the background.

Another unsatisfactory practice on the part of some general contractors has been revealed in the retention of monthly payments. The city demands only a 10 per cent reserve on the value of the work passed on for payment but the general contractor of this class retains 15 per cent on all of his subcontracts. The result is that the general contractor is not putting in any money of his own on the operation except his overhead.

The mechanical trades generally are securing contracts from the city direct and they are reporting that while the requirements of the architects are severe, yet, if they do their work properly, they are sure of their money, although sometimes subject to delay in payments.

The question arises, therefore, whether some contractors are blaming the city unjustly and using criticism as a smoke screen to cover their own unfair practices. The Credit Association is continuing its survey and will make public the results at a later date.

Beating the Deadline With an Asphalt Distributor

THE Jones Beach Causeway job on Long Island, N. Y., was described in CONTRACTORS AND ENGINEERS MONTHLY in some detail in the August issue on pages 58 to 61. There was an interesting section of this job not covered in the article mentioned, namely, the bituminous penetration macadam roadway which was completed by the Westchester Asphalt Distributing Corp., Briarcliff Manor, N. Y., after the original contractor had failed.

On July 27 the New York State Department of Public Works took over the work itself and signed a contract with the Westchester Asphalt Distributing Corp., in order to be able to complete the entire job before August 4, as certain land grants had been given for the parkway with the provision that, if the road was not opened to the public by August 4, the land would revert to the original owners.

The Westchester Asphalt Distributing Corp., started its heating plant on July 29 and put down 20,000 gallons of Texaco 110-penetration asphalt that day. This cleaned up the supply of asphalt at hand so that no work was done on Tuesday, July 30. That night the State ran in a special train of eight cars of asphalt. The train arrived at 5:30 A.M. on the 31st. Steam under 80 pounds pressure was immediately applied and by nine o'clock the two Etnyre distributors had succeeded in pumping over the first load, although the temperature was not over 150 degrees Fahrenheit. This put a great strain on the distributors, but it was absolutely essential that the asphalt should move.

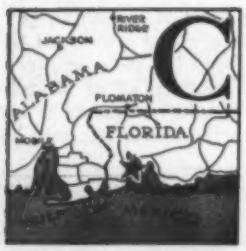
A total of 20,000 gallons of asphalt was applied July 31, 32,000 gallons August 1, 20,000 on August 2 and the balance of 8,000 gallons on Saturday morning, August 3, in a driving sand storm. This completed the job.

The average increase in temperature of the asphalt after it reached the distributors was 120 degrees. The distributors were worked twelve hours each day and the average haul was 3 miles.

Construction of the Pensacola Scenic Highway

Typical Methods Used on Concrete Highway Built on Florida Sand and Clay Base

By R. G. Lassiter & Company



CONDITIONS of road building are so different in Florida from those in most other states that one is likely to overlook the reasons for some of the changes in methods unless the reason is carefully analyzed. One of the finest scenic roads being built in the country today is the 10 miles of 18-foot concrete highway running north and east from Pensacola, Fla., to the bridge over the Escambia River. The contract for this 9-6-9-inch section of roadway was awarded in December, 1928. The rough grading had been done under a separate contract in 1927.

The grading operations involved the removal of 350,000 yards of sand and clay and the construction of several small drainage structures involving about 1,400 yards of concrete. This work was mostly on new right of way located near the coast permitting fine views of Pensacola Bay, and was completed in August, 1928. One type of drainage structure included in this contract is unusual in state highway work. This is the drop inlet to culverts at the foot of the hills and under fills. A 3 x 3-foot concrete riser is built in 4-foot lifts to form a drain for water and silt washed down from the slopes. The riser is similar to those used in reclaiming farm lands and permits the silt to settle out and build up the low spot. The riser is maintained with about 2 to 3 feet of freeboard and as soon as the silt rises to within 2 feet of the top another 4-foot lift is added.

This scenic highway has been called a conservation project by those closely associated with the work as gulleys were developing along this section which in many places had already cut back many feet beyond the line of the present highway. These were filled and either sodded or planted to prevent further erosion. In all places where there was fill which extended toward the shore and which was not protected by other land between the road and the shore the fill was placed with a berm to form a gutter to take off the water to a concrete gutter so that the fill would not wash. The wash of shoulders is one of the most expensive parts of Florida road maintenance. Nature claims Man's attention. Where there is not frost to contend with, the soil is subject to extensive wash and demands expenditures and attention commensurate with those made in the more northern states for other combats with Nature.

Features of Design

The 9-6-9-inch section is what is known as the Maricopa section with the pavement reduced from the 9-inch thickness at the edge to 6 inches thick at a point 3 feet from the edge. A 1¼-inch parabolic crown is used except on curves where the crown is eliminated and the pavement widened and superelevated.

Fine Grading

About 4,000 yards of earth was removed in the fine grading because of an adjustment in grade. This was handled mostly by 2-up mule teams with slip scrapers. The grading was roughed in with a light Austin grader with 8-foot blade, hauled by a Caterpillar Thirty. The subgrade was not rolled except where there was clay in the grade and then a 10-ton Buffalo-Springfield steam roller was used.

Form Setting

Because of the loose soil it was necessary to use steel forms with five pin pockets to the 10-foot length of form instead of the usual three. This is in accordance with Florida specifications for all road work. Blaw-Knox 9-inch forms were used with 6-inch forms on the widened curves for the finishing machine to run on where the widening was about 3 feet. The form setting crew consisted of 2 form setters and 5 laborers while the fine grade crew was composed of 1 foreman, the roller man and the tractor operator with about 4 mule teams with slip scrapers. After the forms were set a Lakewood subgrade planer was used to give the final shape to the grade.

Unloading and Batching Plant

The unloading plant was a standard set-up using a Lorain 55 with an Owen 1-yard clamshell to unload the cars of sand and gravel. Gravel was received from Flomaton, Ala., a distance of about 44 miles and also from Montgomery, Ala., a freight haul of about 180 miles. The sand was all from Flomaton. There was a reserve stock pile but where possible the materials were unloaded direct to the Blaw-Knox bins and batchers to save rehandling.

The operating crew consisted of 1 man in the cars cleaning up, 1 crane man, 1 man on the ground to clean up and to grease the crane and act as a general handy man, 1 man on the batcher, and a foreman who also acted as timekeeper.

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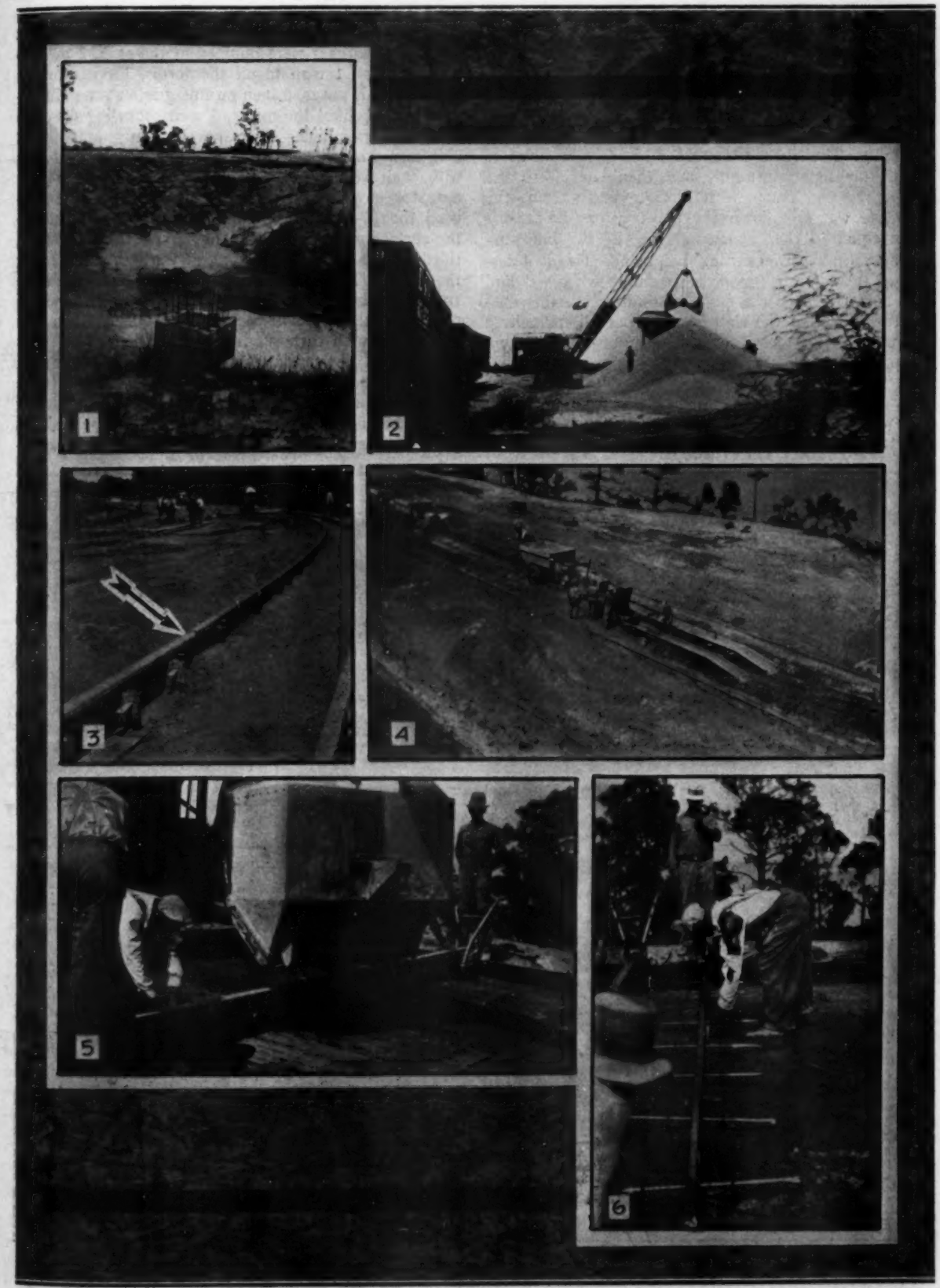
1. One of the drop inlets for culverts used to induce silting of a low spot in the right of way. 2. The Lorain 55 handling aggregate from gondola cars to the Blaw-Knox bins. 3. The Blaw-Knox 9-inch forms set on a curve. The arrow indicates a point of change from 9-inch to 5-inch forms where the thickened section ends on the widened curve. Note that the forms are made with 5 instead of the usual 3 pin pockets because of the lack of stability of the Florida sands. 4. Trucks are being turned on the table. 5. Testing the final grade immediately ahead of pouring. 6. Setting the dowels at an expansion joint.



PRELIMINARY OPERATIONS BEFORE POURING CONCRETE ON PENSACOLA-ESCAMBIA SCENIC HIGHWAY

See description on page 76

A fleet of 15 Ruggles 2-batch trucks handled all the hauling on a sub-contract at a figure per square yard of completed pavement. The paving was handled from a point about 3 miles from Pensacola to the batching plant located about 3 miles from the Escambia Bridge, then the section from the bridge to the plant was paved and last the section from Pensacola to the first strip. The average haul on the job was about 3½-miles. The trucks were turned by the subcontractor on a Blaw-Knox turntable and then backed to the paver. In accordance with Florida specifications the subgrade was wet down the night before for a distance equal to the expected paving of the following day and also kept wet during the paving. This is necessary as the sandy subgrade is firm only when wet and it is aimed to keep the grade as solid as possible during the time that the slab is being poured. Planking was used for the trucks for a distance of 400 feet from the paver.

CONCRETING OPERATION

A well-balanced concreting crew was maintained but due to the lack of trucks on the long haul the maximum day recorded was about 800 feet. The concreting crew consisted of 1 hoseman just ahead of the paver, 2 men to dump cement from the bags onto the batch before the batches were dumped at the skip, 2 men to dump trucks, 1 man to oil the forms, 1 operator for the Rex 27-E paver, 6 men on fine grade at the Koehring planer behind the mixer, 3 men shoveling concrete using a center man who shoveled only and the 2 side men who shoveled and also spaded at the forms with their regular shovels, 1 man on center strip, 1 operator on the Ord finisher, 3 finishers, 2 of whom used the 12-foot longitudinal float and smoothed up the surface with the 3-foot long-handled floats and the third man doing all the edging at the joints and along the forms. This same finishing crew also checked the surface with Lakewood straight-edges under the direction of the state inspector, and rubbed down any high spots with carborundum bricks as needed. Two men spread the burlap on the finished surface and sprinkled the burlap during the first 24 hours. The burlap was carried in 3 x 20-foot strips on a rolling bridge behind the finishing equipment. The finished pavement was covered with sand following the re-

CONCRETING OPERATIONS ON THE LASSITER CONTRACT AT PENSACOLA, FLA.

1. Paving on a long fill. 2. The Ord finisher at work. 3. A well finished expansion joint. 4. Using the longitudinal float to get the bumps out of the road. 5. A view from behind the mixer boom showing all the finishing operations and curing under way. 6. Spreading the burlap.

moval of the burlap the day after pouring and the pavement cured by sprinkling for 10 days. A crew of 6 men was used for this purpose. This seems like a large number but the fact that the pavement was really sprinkled is assured by the results of the tests of the cylinders which showed 3,200 pounds average compressive strength at 7 days and 4,200 pounds at 28 days. The sand was removed from the pavement at the end of 14 days and the pavement opened to traffic.

A scratch template board cut to the exact shape of the subgrade was used without nails or bolts immediately behind the planer to check the subgrade before any concrete was poured. The template was made from a 3 x 12-inch board. Expansion joints were set every 40 feet with header boards using eight ½-inch dowels each 2 feet long and heavily wrapped with paper and with tin sleeves at one end. The joints were made with ⅝-inch Elastite. No reinforcing went into the road. No center strip was used except where the widening of the curves made the total width of the pavement more than 20 feet. Then Truscon center strip was set at the middle of the pavement.

WATER SUPPLY

Water was abundant for this job and was supplied through a mile of 2½-inch pipe and the remainder of the 4 miles was 2-inch pipe. A Rex road pump was used to supply the line which was set with taps every 400 feet. The paver hose was about 250 feet long.

PERSONNEL

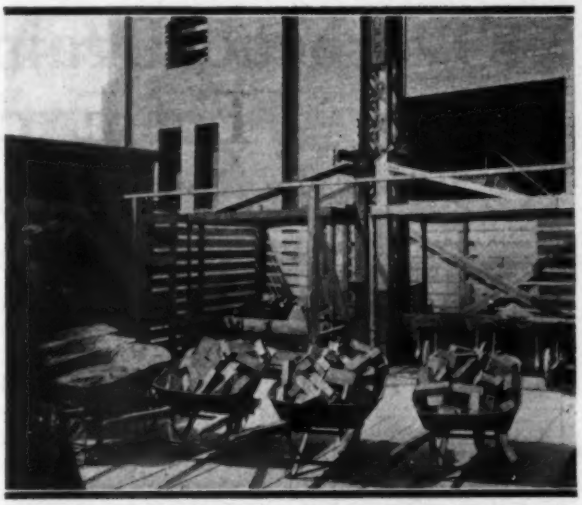
C. M. Perritte was Superintendent for R. G. Lassiter & Co., of Raleigh, N. C. O. J. Semmes, Jr., was Resident Engineer for the Florida State Road Department.

Seasonal Labor in the Building Industry

PART of the waste due to seasonal periods of work is unavoidable, yet it is possible to greatly reduce this loss through proper planning of new construction and maintenance work as noted in a report of the Boston Building Congress, through proper planning of new construction and maintenance work. The average employment for the year is 80 per cent. This means that the men are idle two or three months each year. Men are paid by the hour, but must live by the year. Experience has shown that few skilled workers have recourse to employment in other trades during the slack season in their own particular trade. While working, then, mechanics must earn enough to carry them through the idle period. The hourly wage, therefore, must be high enough to provide this idleness insurance.

The loss in money to the construction industry during the course of the year is tremendous and must be borne by the property owners. The data presented refers to organized labor in the Boston district covering about 27,000 workers. If unorganized labor is counted, these curves will apply to 35,000 men. With an average of 20 per cent unemployment, the equivalent of 700 men must be supported yearly by the industry. Assuming the average wages to be $2,000 a year, these enforced vacations cost the property owner $14,000,000 annually.

The money waste is only part of the loss sustained through these employment conditions. Poor construction is inevitable when poor workmen only can be obtained or when men must be rushed from one job to the next. Good workmen are secured with difficulty through the busy season. Poor workmanship and delays caused by unavailable labor may be largely avoided by careful planning of construction periods.



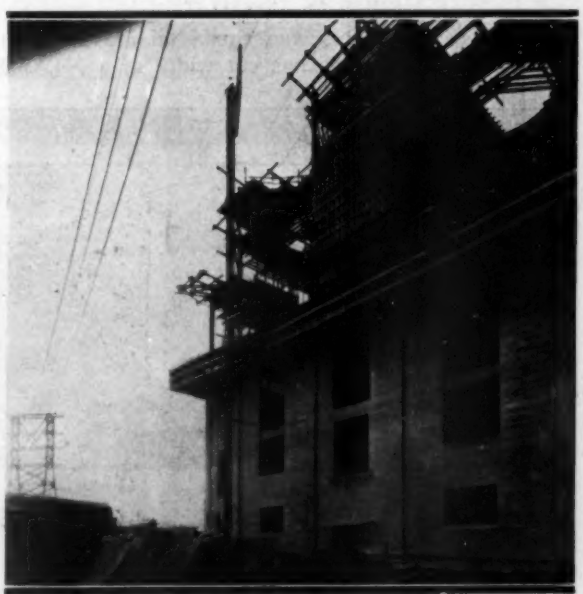
Wheelbarrows of Brick and Mortar Ready to Be Hoisted for Use on the Building by an Insley Elevator

Steel Mast Serves Material Elevators and Portable Derrick

ON a power station job for the Buffalo General Electric Co., Derdenger Construction Corp., Buffalo, N. Y., set up a very interesting layout of equipment. To conserve both space and equipment, a 120-foot Insley steel mast was installed, operating with two material elevators running on opposite sides of the mast. Each of these elevators, as shown in the illustration, is capable of handling three wheelbarrow loads of material.

The second illustration shows the mast hoist equipment for raising the elevators. As will be noted the mast likewise carries a 20-foot portable derrick boom for hoisting steel, lumber and other long materials.

This mast hoist is operated either as a concrete hoisting plant with an auxiliary material elevator running on the opposite side of the mast from the concrete bucket or the bucket can be removed, as in the case, and the second material elevator put on the mast converting it into a double steel hoisting plant.



The Mast Hoist Equipment for Handling Materials on the Power Station

Overhead Drain Prevents Flood of Excavation

Indiana Mine Uses Scheme That Contractors May Employ Under Similar Conditions in Cuts to Keep Pit Dry

SURFACE water from an area of 70 acres draining into a pocket ravine close to the point where a shovel entered in upon the coal in the opening of a new stripping pit at Mine 17 of the Maumee Collieries Co., Terre Haute, Ind., brought up a serious drainage problem. The manner in which this was solved will be of interest to contractors who may meet similar conditions in large excavations or in cuts on grading projects.

A thorough examination of existing conditions at Terre Haute showed that the most feasible solution of the problem was to follow the natural run-off line and carry the surface water directly across the proposed box cut by means of some sort of a conduit. This plan would avoid considerable expense of power pumping, the only other way in which this amount of surface water could be taken care of. For this particular purpose a conduit which had a beam strength sufficient to require few supports was necessary to insure freedom of excavating and mining operations. For this reason and because it offered a quick and easy means of installation, 36-inch Armco corrugated pipe was used. In addition it offered the advantage that it might be readily dismantled and removed to some other point after it was no longer needed where originally installed.

Method of Installation

The box cut rib lines were first established and an allowance made for the box cut width of a No. 300 Marion steam shovel. Outward, at right angles from these lines on both sides of the proposed cut trenches 3 feet deep were cut at a grade line of 1 per cent. Allowance was made for continuing this grade across the proposed cut, but no trenching was done for that section.

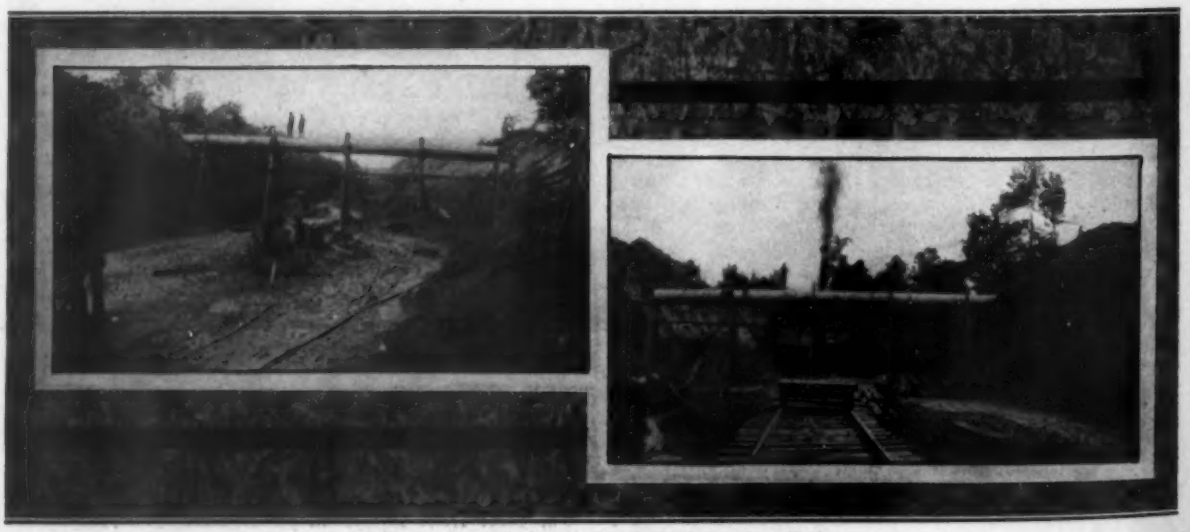
After completing the trenches, the two ends of the conduit each consisting of six 16-foot sections, were laid and firmly joined with stout connecting bands and earth securely tamped along the sides. In laying the end sections, an accurately measured distance was reserved for the middle section. Laying the end sections first and omitting the middle section permitted the steam shovel to make a 19 x 80-foot cut and to deposit the yardage on either side on the two end sections. Laying the pipe in trenches as described was sufficient protection to prevent disalignment and injury during the shovel operations.

Bent Construction

Immediately after the shovel had cut through five timber bents, previously framed, were placed on 8 x 10-inch mud sills properly spaced to provide a support at each joint and then temporarily cross-braced. These bents were constructed of 4 x 4-inch uprights and batter braces and 2 x 6-inch strap and cross-braces. The position of the support strap braces holding the pipe joints was determined by stretching a string line from the inner ends of the outer sections of pipe first laid.

Following erection of the bents, each of the six sections of pipe were hoisted into position on the cross braces by the steam shovel which then proceeded on its

(*Continued on page* 86)



Two Views of the Overhead Drain as Installed

Concrete Road Building Plant and Its Operation

By Tyree L. Bell, Jr.

General Superintendent, F. P. McElwrath Co., Corsicana, Texas

MODERN development in the field of plant management has resulted in many improvements for the highway contractor. Development has been so vast in many cases that road builders could not keep abreast with it. They have had scarce time to study many of the economical phases of proper choice of machines for use in their construction plants.

The contractor's task has been to select from a mass of available good equipment that which would best fit the proposed scheme of operation, to perfect the use of the machines until they would give regularly all the service of which they are capable and to coordinate their functions into a smoothly running plant.

Since it must be admitted that a contractor's business is to make money, he must be more interested in the return of production than in the creation of outstanding production records. Record runs reflect very little profits except in the case of an occasional spurt for advertising purposes. The maximum number of yards is most likely to result from the program of steady uninterrupted production. Paving should be viewed as a series of operations, each performed at a rate which yields production in harmony with all the others. The paving mixer is the key producer, the pacemaker for the entire plant. The other machines and crew must be assembled around the basic idea that their interdependent production efforts must be balanced and coordinated around the paver. In the sequence of operations which must be performed, each element must be scheduled to do its part a little in excess of the capacity of the pacemaking mixer, so that short delays need not affect the output of the mixer.

In addition to the larger machines used on road building work, the contractor will find it worth while to study the economies in various special hand tools and other innovations that have been developed to fill some particular need. If the equipment problem has been settled, the contractor must consider the proper choice of crew. As modern methods requiring power-driven machines have so largely replaced manual labor, the labor that is still used must be of a higher general quality than was formerly the case.

The contractor's object is to do good work and, at the same time, obtain a profit from his work. His opportunity for obtaining a profit is largely dependent upon the machinery which he uses and the efficiency of the labor which he employs. Therefore, the selection of the machinery, its assemblage into a plant and the efficiency of its employment are of paramount importance to the contractor. Efficiency is no accident, nor is it to be had purely through energy and enthusiasm. Efficiency ordinarily results only from careful systematic planning, from the determination of some specific course by which a desired result can be had and then from setting about with tireless persistence to follow that course. It is the result of careful planning, hard work and good management.

T. L. B.

Rough Grading

Rough grading cannot be summarized briefly into anything resembling a standard because the work to be done varies so greatly. The specifications and the design of the embankment, the topography of the country, the nature of the soil and the season for doing the work all require consideration in determining how the rough grading should be done. The methods of grading in themselves have not shown the same degree of improvement as has the surfacing. The fresnoes and wheel scrapers of the south and southwest still keep the price of dirt work at such a low figure that it is not sufficiently attractive to interest the efforts of alert contractors. The jobs are let in small units and light yardage.

In some other sections of the country, where the extent of rough grading on heavy embankments has resulted in a more substantial and better developed basis of procedure than in Texas, steam shovels, the dragline, elevating graders and the new crawler wagons seem to prove quite satisfactory.

The Material Yard

On highway work it is very important that an adequate supply of proportioned material be available for transportation to the mixing plant at all times. The choice of a plant will depend largely on the relative certainty and ease of delivery of material as needed. On some large jobs, it is feasible to provide vast storage spaces in which material can be stocked during the winter when construction is at an ebb, so that in the spring work can be resumed at once by utilizing this material.

The equipment required for a plant where the necessary materials are delivered direct to the job as needed consist of a crane, and overhead bins equipped with measuring devices and for auxiliary service, special trackage under cement warehouses. The crane is of the crawler type, full revolving and handling a clam-

Delivery of Dry Aggregates by a Multiple-Batch Truck

shell bucket ranging in size from ¾-yard to 1¼-yard. If the capacity of the crane and the skill of the operator are sufficient all the unloading and proportioning sufficient for the full requirements of a 7-sack mixer can be accomplished during daylight hours with the one crane. Quite frequently, however, it is found that a night operator is necessary in order to unload out of cars into storage enough of the materials to free the regular operator from a part of the car unloading that he may concentrate on keeping the bins full by digging directly from the stock pile. Greatly increased operating speed can be obtained by loading directly from the stock piles to the bins rather than from tightly packed cars to the bins.

Construction Track

The choice of track layout will depend on the efficiency of the switching service provided by the railroad company. A crane, some bins and a stock pile are ordinarily set near the middle of an unloading track. The length of track necessary is twice the combined length of a string of cars long enough to hold the usual amount of material needed for one day's work. The reserve stock piles should be provided as a source of aggregate supply if regular shipments of aggregate are delayed in transit. Storage of cement should be governed by the same consideration. In addition, a space should be available for the emergency storage of cement that comes in while the job is shut down.

Bins

Bins are available in various sizes and designs. In general they should be rigid and strong enough to withstand unusual and erratic loading and at the same time, they should be light enough so they can be moved as economically as possible.

The measurements of aggregate by weight is now an accepted and established practice. Certain highway departments specify weight measurement while others favor them. Weight measurement provides for greater accuracy in the proportioning of aggregate. The bulking of sand due to the moisture content and the varying voidage of the coarse aggregate seriously disrupts the accuracy of volume proportioning. Several manufacturers offer weighing batchers that are entirely satisfactory in operation and comparatively inexpensive. Changes in the sizes of the batches can be accurately made with ease and absolutely no delay.

The use of bulk cement with the help of bucket conveyors, screen conveyors and proper weighing devices offers an opportunity for economy.

Hauling

Hauling by means of trucks is still the most widely used method of transporting materials on road building projects. For hauling one, two or three batches of proportioned materials, a truck is the most flexible and adaptable transportation means that we have. At present the tendency is for large multiple batch trucks to displace the lighter single batch ones. Most contractors prefer to hire their trucks and to pay for them on a batch-mile basis. Some still prefer to operate their own fleets, thereby assuring constancy of service at all times.

If trucks are used, there should be a sufficient number of them employed to insure there always being at the mixer enough trucks standing by to remove any possibility of the mixer waiting for a batch. The number necessary is dependent upon the speed of the truck, the length of haul and the time required at the material yard for batching. Any money spent by the contractor in maintenance of roads which will assist the trucks to maintain their full speed without having to slow down for bad holes or barriers, will greatly react to his benefit.

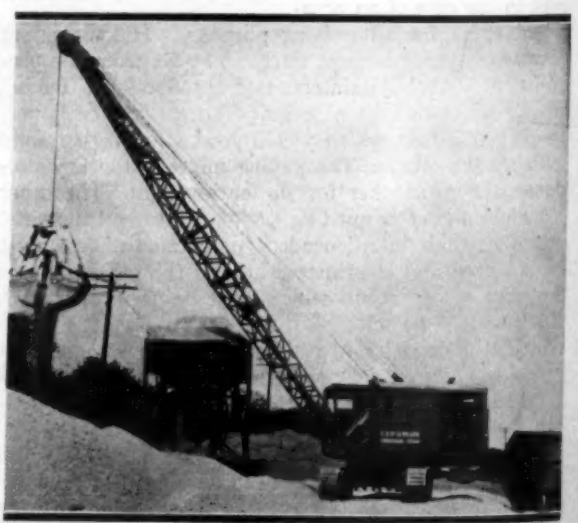
In some cases turntables have been found economical as part of the equipment designed to save time in turning trucks. In certain localities, narrow gage railways are an advantage, but this type of plant has not been accepted as readily as seemed inevitable at one time on highway work.

The first cost of narrow gage equipment is high. The cost of transporting the equipment from job to job and the time delay in setting up such equipment is likewise high as compared with the more mobile truck. Nevertheless trains can be organized and run on more dependable schedules after the construction line has been established, so that a combination of narrow gage railroad and trucks is to be recommended when the length of haul is long enough to warrant it.

Water Supply

It has been most aptly said that the water supply is the life of a paving job and the pump is the heart of the supply. When the pump stops the work stops. Second only to delays of management, the Bureau of Public Roads time studies show that more time is lost on paving outfits from failure of the water supply than from any other individual cause.

Modern development in pumps has made available



A Standard Layout for Unloading and Proportioning Aggregate

Foundation and Alignment of Forms Mean Much in the Smoothness of the Completed Pavement

several that are especially designed for road building. Some of them will supply from 80 to 120 gallons per minute against a 500-pound pressure. Sometimes 40,000 to 60,000 gallons of water per day are required during the hottest part of a Texas summer. Although such demands can be met with a single standard road pump if in good condition by doing some of the curing at night, it is better practice to provide two independent pumps.

It has been found especially advantageous where the location of the water supply allows such procedure in using two pumps to keep one pump ahead of the mixer in order that its supply and pressure will remain undiminished by the demands of curing while the other pump is left behind to furnish curing water. Pumping from different sources and working against each other, the two pumps in that way should maintain a constant pressure throughout the entire line and neither mixing nor curing interferes with the other. Then, in the event of shut down, either could temporarily supply the combined needs of the entire job.

Enough water pressure and pipe capacity should be available so that if one batch of concrete has been taken from the mixer, there will be enough water available at once for the next batch. This feature involves only simple hydraulics but pumping equipment and construction practice have now become so standardized that except in unusual cases, no particular thought is given to hydraulic studies. Black iron pipe is used everywhere for carrying the water from the pump along the road. It should be laid in a ditch so that leakage water will naturally drain away from the job. Instead of a 2-inch pipe many contractors are now using 2½ and 3-inch pipe, figuring that the decrease in friction, as well as the greater capacity of the pipe, will offset the added purchase cost and transportation charges.

Relief valves at the pump and at the mixer are important as safety devices in the event of a sudden stoppage. Outlets should be provided every 500 feet for the connection of a 300-foot mixer hose. A large number of contractors use two mixer hose, that one may always be furnishing water to the mixer, while the other is being moved ahead. Hose for the mixer in the very best obtainable quality, in 1½ to 2-inch sizes, should be provided.

FORM SETTING AND FINE GRADING

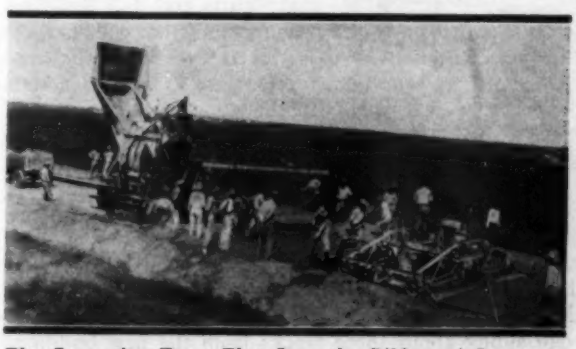
To a large extent the tools and methods used in form setting are the same everywhere in this country. It has long been recognized that to secure a smooth riding pavement, it is necessary to have strong, rigid and well-set forms. While several makes of forms are on the market, the designs of all types are sufficiently similar to standardize their setting operations. Forms should be supplied in amounts at least twice that of a maximum day's run. Economy in forms is penny-wise economy. The farther in advance the forms are set, the more economical can the subgrade crew work. The forms are the gage and template for both subgrading and finishing. Consequently, contracting has all along sought forms that have offered with ease of installation the greatest strength and rigidity.

After the forms have been set, the subgrade is ordinarily scarified thoroughly from form to form to a depth of 0.2 foot. A subgrading machine, frequently equipped with an auxiliary scarifier, is next pulled along the forms, making an initial cut and leaving the subgrade slightly above the net grade. The excavated material is spread uniformly along the shoulders. The subgrade should then be lightly rolled with a power roller weighing preferably from 3 to 5 tons. When the subgrade has been rolled to a uniform compactness, the subgrader should again be run over, the cut being made to the exact neat lines of the section and the excavated material wasted. Pulled behind the paver another subgrading machine, called a trail grader or subgrade planer can be used to excellent advantage.

MIXING

The 7-bag size of mixing machine is now most generally used, but any paving mixer ordinarily purchased by a contractor will be found to be a dependable machine. As stated before, the mixer is the pace maker for the entire operation. It is the bottle neck of the production. All the other elements of the plant should be synchronized and organized to assist in securing from the mixer its maximum capacity in output. The cycles of full operation of the different machines under a 1-minute mix specification will range from 1 minute and 10 seconds to 1 minute and 25 seconds. Mechanical devices are now available to control the cycle of the operation, but as yet are not generally used, for, as a rule, an alert operator can get out of the mixer its maximum capacity provided the other elements of the plant function properly. To develop the full capacity of the mixer, the operator must be able to make it hoist, mix, dump and travel simultaneously.

The acceptance of the water-cement-ratio theory is credited to the establishment of greater accuracy in the control of water, and devices for this purpose have been considerably improved in late years.



The Concreting Team That Lays the Ribbon of Pavement.

FINISHING

A straight and rigid form line and a concrete of uniform consistency are the prime essentials of a good finish. The tools and machines to be used, whatever they may be, cannot get the results of which they are capable without such assistance.

Specifications and the whims of certain engineers sometimes require special hand methods of finishing behind the machine. Such finishing is too dependent upon personal skill. A level unyielding form line and a properly functioning machine provide a uniformity and mechanical exactness of surface finish not at all possible where hand tools are used.

SHOULDERS

The demand for greater refinement in the dressing of the shoulders has occasioned the development of machines the finished work of which should please the most exacting. Such machines running on the pavement with blades, gaged by the edge of the slab cut the shoulder and slope to the exact section of the plan. Both, however, are dependent on an adequate supply of loose material on top of the shoulders.

BENEFITS OF IMPROVED METHODS

Better roads and cheaper roads are being built. Such improvement has been brought about by the speeding up of operations and the consequent increased efficiency and reduced labor and overhead costs. If you will reflect that, within a period of five years, the output of paving plants has been doubled, that the labor cost has been cut in half and that the plant expense has not increased, you can appreciate the wonderful strides that have been made in concrete road building.

ACKNOWLEDGMENT.—From the *Proceedings*, American Society of Civil Engineers, Vol. 55, No. 6, p. 1399-1404.

Damaged Credit Can Never Be Completely Repaired

CREDIT is the greatest asset from an economic standpoint in the world, because it is the basic foundation upon which all commercial, industrial and financial activity is carried on. It is, however, a very delicate commodity which can be more easily destroyed than created, says M. H. Cahill, President, New York Bankers Assn., in an article in *The Associated Contractor*.

Someone has aptly compared injured credit to a broken piece of beautiful porcelain. You may glue it together again and it may seem as good as of old, but the cracks are still there and you cannot forget that it was broken.

Credit is based upon confidence, confidence in man's resources and ability to pay; confidence in his character, capacity and integrity; confidence in the stability of the conditions surrounding his business. Credit making is an opinion of future conditions and of the ability of the contractor to carry out successfully his business contracts.

The contractor, therefore, who honestly secured credit is doing so upon the positive assumption of assured future profits which are supposed to result from the current transaction which he is endeavoring to finance. The entire theory of banking is based upon the proposition that when credit is extended, the loan is to be used strictly for a current and temporary transaction from which will be realized profits sufficient in amount to pay off the liability thus incurred when due.

Capital is a fixed investment and it should be sufficient in amount to amply care for all necessary fixed assets required in a particular business. As for example: if a man decides to engage in the trucking business because he has secured a contract to haul stone from one point to another at a certain price per ton, his investment in the truck would represent capital and he should have sufficient money of his own to purchase it. If, however, he wishes to borrow money to purchase gasoline and oil to run the truck, this would represent a credit transaction as the loan would be temporary and he could pay for it when due out of his profit.

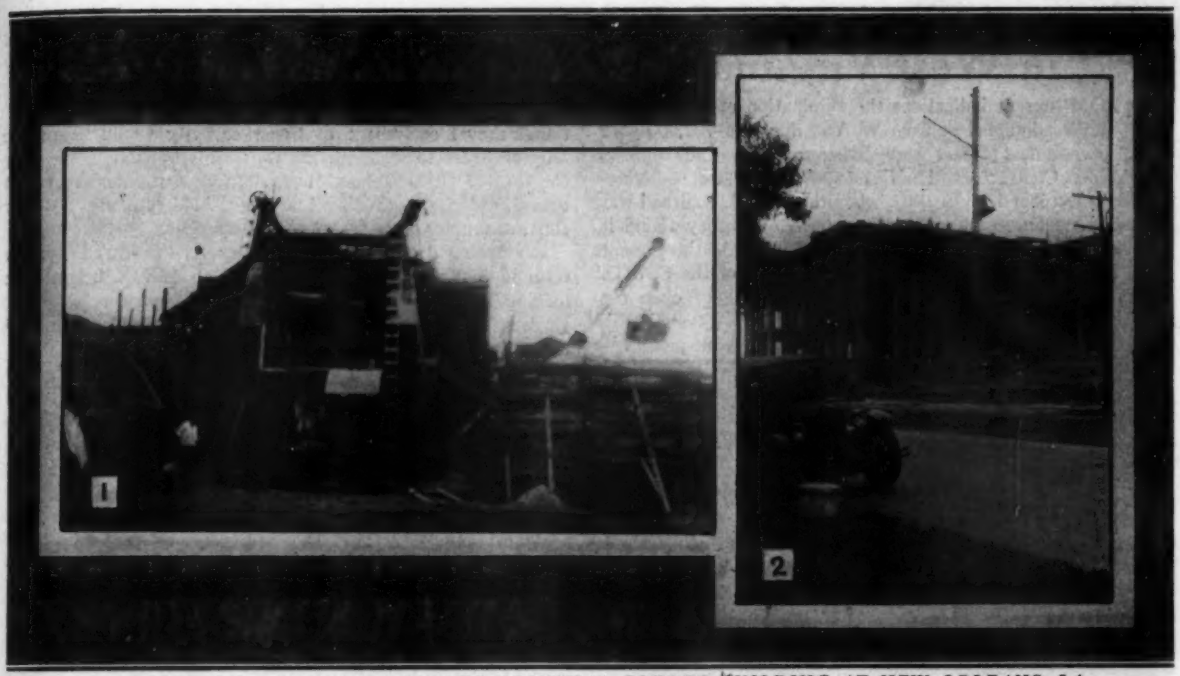
Handling Concrete on a Building for Handling Criminals

R. P. Farnsworth & Co., Ltd., Erect Own Ready-Mixed Concrete Plant About Three City Blocks from Job for Producing 14,000 Yards for New Orleans Criminal Courts and Jail Building

IF the justices of New Orleans who will sit in the new Criminal Courts and Jail Building when completed will bestow justice as speedily as the contractors are pouring concrete in the structure the Crescent City will gain an enviable reputation for its criminal procedure. This reinforced concrete structure, which is 447 x 149 feet and will be 4 stories high, involves pouring 14,000 yards of concrete and the placing of 700 tons of reinforcing steel. To facilitate the production of concrete the contractor decided to erect a ready-mixed concrete plant on a railroad siding about three blocks from the new building. This was determined upon after all factors of haul, the advantages of numerous small mixers scattered about the job and other conditions had been given due consideration. The central plant seemed to offer the least trouble and most nearly approximated factory production.

CENTRAL MIXING PLANT

On a spur track available near the building to be erected a temporary but well-thought out central plant was erected. Sand and gravel were received by rail in gondola cars which were unloaded at night or at times when the plant was not running to stockpiles at either side of the batching plant and bins. The stockpiles were well boarded high enough to permit the materials to run by gravity to small pits from which it was continuously removed by a bucket elevator each for the sand and gravel. A Koehring crane with ¾-yard Blaw-



CONCRETING EQUIPMENT ON THE CRIMINAL COURTS BUILDING AT NEW ORLEANS, LA.
1. The central mixing plant on a spur track about three blocks from the job. 2. The Insley steel concreting tower which with an auxiliary wooden tower handled all the concrete for the entire structure

Knox bucket was used for the unloading of the aggregates. The cement was received in box cars and unloaded by wheelbarrows to the cement storage house which was two stories high. To elevate the cement as needed for the batches the skip of an old concrete mixer was used as an elevator and raised vertically.

A Blaw-Knox inundator with bins was used to secure the specified 2,000 to 3,000-pound concrete. A 3-bag batch was used with the ½-yard Smith mixer. The proportions worked out approximately 1:2 5/6:3¾.

Placing the Concrete

Three 1-yard trucks were used to haul the batches from the central mixing plant to the job where the concrete was dumped into the bucket of the Insley tower or of the wooden tower which served the opposite section of the building. The best day's pour was 349 yards of concrete mixed, delivered and poured into the forms.

Personnel

The architects for the Criminal Courts and Jail Building for the City of New Orleans were Diboll & Owen of New Orleans for whom Harold Raymond was Resident Engineer. The contractors were R. P. Farnsworth & Co., Inc., New Orleans. O. J. Farnsworth, Vice President, was Superintendent in charge of this job for the company.

Work on the Wanaque Aqueduct

THE contract for the construction of the Wanaque Aqueduct involves considerable excavation and the laying of a double line of 74-inch steel Lock Bar pipe for a distance of 14 miles and a single line of pipe 4 miles long. This portion of the $5,127,000 contract for the Wanaque Aqueduct was let to T. A. Gillespie Co. of New York and is being built under the supervision of Fuller & McClintock, consulting engineers, New York, for the North Jersey District Water Supply Commission.

The steel pipe was made in sections about 30 feet long and weighing about 7½ tons per piece. In laying this line, J. P. White Co., of Passaic, N. J., the subcontractors for this part of the work, have been using a 2-yard Link-Belt crawler dragline for lifting these heavy sections and also for placing valves weighing over 14 tons.

The system used in laying this pipe line was to dig enough trench to set two sections of pipe, then unhook the hoisting line on the dragline bucket and hook it on to the sling for handling the pipe sections, then lift the pipe into place, reattach the dragline bucket and fill in. This proved to be a very good method for handling this work both efficiently and economically.

Laying Sections of Steel Pipe 30 Feet Long and Weighing 7½-Tons Each

Tunnel Elimination Job in West Virginia

FROM present indications the elimination of the C. & O. Railroad tunnel at Ona, W. Va., due to a 700,000-yard open cut, 112 feet high, being made by Langhorne & Langhorne, Contractors, Huntington, W. Va., will be completed by October 15. In 1907, when the C. & O. Railroad was extending its lines east of Huntington, W. Va., they found it necessary to build a 1,400-foot tunnel at Ona. At the present time, in keeping with the modernization policy of the C. & O. Railroad this tunnel is being eliminated by a huge open cut 112 feet deep and 300 feet wide at the top.

PROGRESS OF EXCAVATION TO REMOVE C. & O. TUNNEL AT ONA, WEST VA.

Above—Photograph taken in November, 1928, soon after the work began, showing the 300-foot wide cut at the top of the hill. Below—Status of work in May, 1929, when hauling had been changed to industrial railway dump cars and gasoline locomotives

There are approximately 700,000 yards of excavation in this job, 80 per cent of which is classed as rock. The excavating contract was awarded to Langhorne & Langhorne, of Huntington, W. Va., and R. L. Black, Yawkey, W. Va., are subcontractors on part of the job.

The accompanying photograph shows the status of the job shortly after it was started in November, 1928, and shows the beginning of the 300-foot wide cut at the top of the hill. The excavating equipment used to start the job consisted of 4 Lorain 75's 1¼-yard gasoline shovels. The hauling equipment consisted of a fleet of dump trucks and Iron Mules. As the work has progressed trains of 5-cubic yard, two-way dump cars, 36-inch gage, pulled by Plymouth and Midwest gasoline locomotives were added.

The later picture, taken in May, 1929, shows how far the job had progressed and the later method of hauling. In June 95,000 yards were removed and in July 85,000 yards were excavated, most of it in hard shale and rock, requiring blasting. All materials were loaded and hauled for fills approximately 1,000 feet on either side of the cut.

At the time the job was started it was thought that additional shovel equipment of larger capacity would be needed later in order to maintain the excavating schedule. By using the four 75's two 10-hour shifts daily, it was found that each shovel had a capacity of 1,000 to 1,200 yards per 10-hour shift, or ample to maintain the job schedule.

In loading the dump-cars the shovels averaged a 4-car train in 3 minutes, dumping at a 17 to 18-foot height. On loading Iron Mules, the shovels average approximately 1,000 yards per 10-hour day. A 1 to 1 slope has been maintained the entire 112-foot depth of this cut, without any hand work.

An interesting side light on the excavating work is the fact that before starting the excavating the entire tunnel had to be reinforced with 12 x 12 timbers at a cost of $52,000. This represents practically a dead loss as the manner of bracing eliminates any salvage value to the timber.

PERSONNEL

On railroad work speed is an essential and a great deal of the credit for organizing and pushing this job to completion ahead of schedule is due to A. M. McLeod, Superintendent for Langhorne & Langhorne, and his brother K. N. McLeod, Assistant Superintendent. I. W. Fuller is President of the company. C. O. Johns, Chief Engineer of the C. & O. Railroad, is in charge of this work for the railroad.

Overhead Drain Prevents Flood

(*Continued from page* 80)

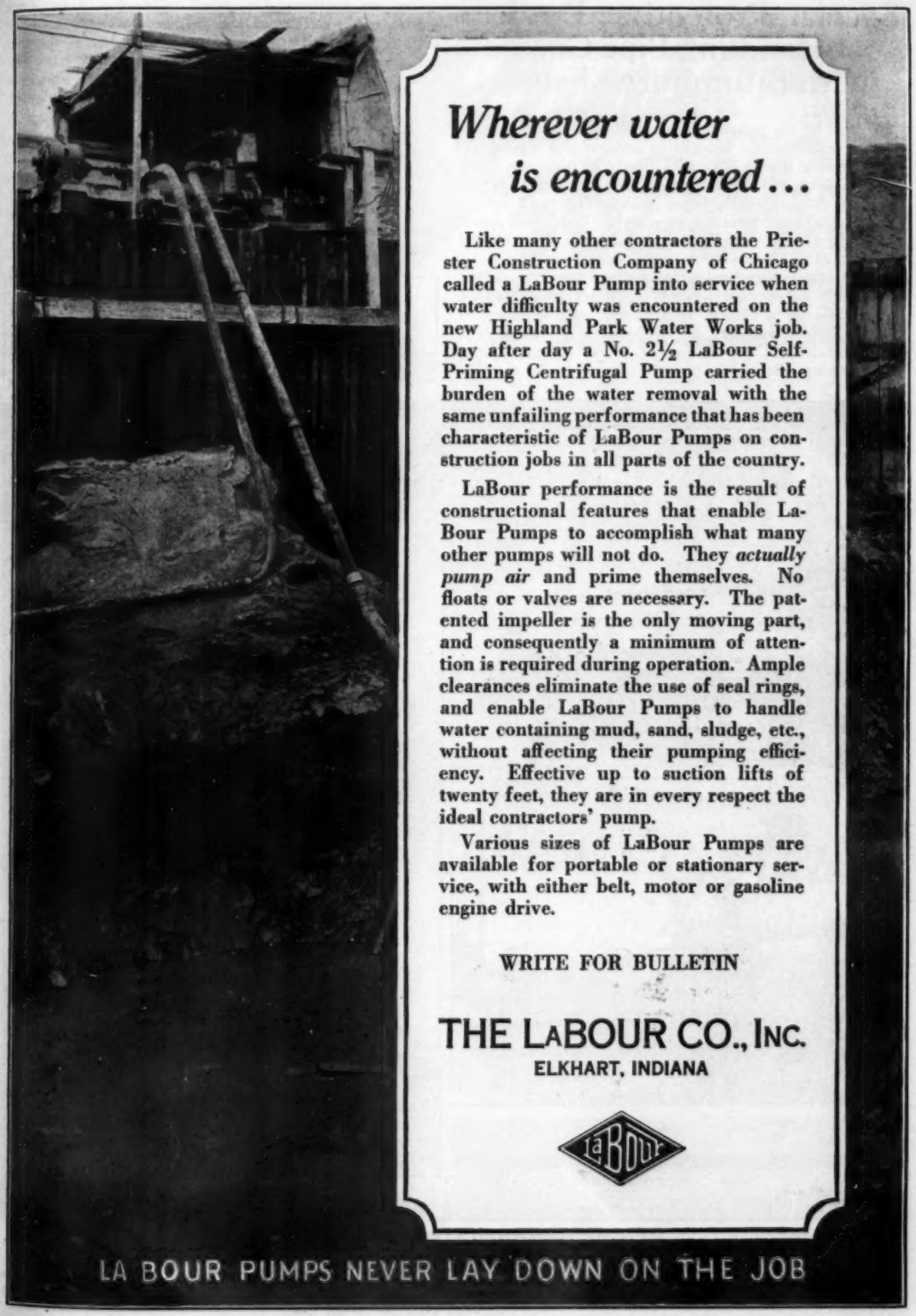
work in the pit. Joints were made with special connecting bands, resulting in a continuous watertight channel at a height sufficient to offer little interference to excavating operations.

Experience with this drain is of particular interest for several reasons. The economical type of construction used proved adequate more than once under full hydraulic load, demonstrating the high beam strength of corrugated iron pipe when supported on bents. The line served through two spring seasons practically without attention. Being light and simply constructed, it is ready for speedy removal and reinstallation elsewhere on the property at a minimum cost and, going back to its original purpose, it has been successful for two years in eliminating the necessity of installing and operating an expensive power pump.

Fireproofing Structural Steel

A BOOKLET entitled "Fireproofing Structural Steel" has recently been published by the American Institute of Steel Construction. The book is written by Jack Singleton, District Engineer for the Institute, and is a discussion of the media to be used in the protection of structural steel against fire hazards. The question of fireproofing has played a very great part in the development of the modern building, and has been directly the greatest factor affecting the structural steel industry. However, the methods of insulating steel which have been used thus far have been to the disadvantage of the steel industry, in that the amount of concrete used to insulate the steel is generally excessive, while the steel erected must also be heavy enough to carry the designed loads, both live and dead.

The problem is to develop some material which will protect the steel members by surrounding it with a dead air space. The material which can be so used must be obtainable in large quantities, inexpensive, easily manufactured without difficult processes or methods being involved, and must possess marked value as an insulator against heat. When such a material is developed the problem now existent will be practically solved.



Wherever water is encountered...

Like many other contractors the Priester Construction Company of Chicago called a LaBour Pump into service when water difficulty was encountered on the new Highland Park Water Works job. Day after day a No. 2½ LaBour Self-Priming Centrifugal Pump carried the burden of the water removal with the same unfailing performance that has been characteristic of LaBour Pumps on construction jobs in all parts of the country.

LaBour performance is the result of constructional features that enable LaBour Pumps to accomplish what many other pumps will not do. They *actually pump air* and prime themselves. No floats or valves are necessary. The patented impeller is the only moving part, and consequently a minimum of attention is required during operation. Ample clearances eliminate the use of seal rings, and enable LaBour Pumps to handle water containing mud, sand, sludge, etc., without affecting their pumping efficiency. Effective up to suction lifts of twenty feet, they are in every respect the ideal contractors' pump.

Various sizes of LaBour Pumps are available for portable or stationary service, with either belt, motor or gasoline engine drive.

WRITE FOR BULLETIN

THE LABOUR CO., INC.
ELKHART, INDIANA

LA BOUR PUMPS NEVER LAY DOWN ON THE JOB

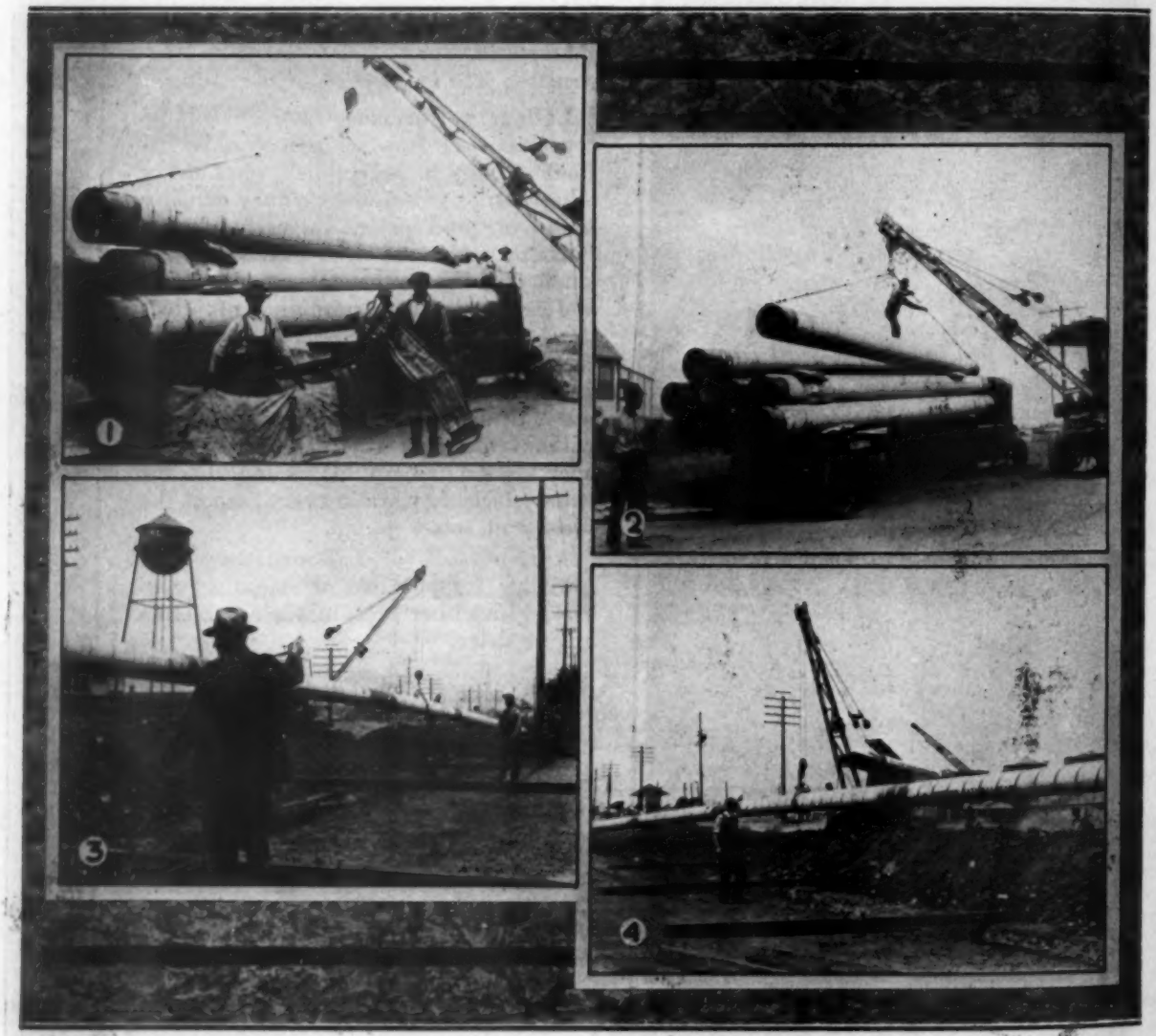
Special Protective Devices for Handling Pipe Coated with Bituminized Fabric

SPECIALLY designed mattresses or cushions have been used by the contractors engaged in the construction of a section of the 282-mile natural gas pipe line of the Pacific Gas & Electric Co. At a cost of $500 the contractor that is distributing the sections of pipe along the right of way had 60 special mattresses made. The pipes are all wound with a mechanical application of bituminized felted fabrics in a spiral wrapping around the pipe. The covering is cemented to the pipe by a hot bituminous compound.

In hauling these wrapped pipe sections from the various points and distributing them to the points along the line where they are to be used requires great care so as not to injure the covering. The use of the mattresses enables the contractor to haul nine sections at a time without injuring the wrapping. Before the pipe sections are loaded onto the trucks, the mattresses are placed on the top of the truck bolster and then four sections of pipe are loaded onto the truck. Then mattresses are placed on the top of the four sections of pipe loaded onto the truck and three more sections of the pipe loaded. Then mattresses are placed on top of the three sections of pipe and two sections are loaded, making a total of nine. The mattresses prevent rolling or damage in transportation.

A special sling is used with the truck crane in handling the 90 and 120-foot sections of welded pipe so that the pipe covering will not be injured in lowering into the trench. After the sections of pipe are unloaded from the truck they are welded into 90 and 120-foot sections. These sections are picked up by a truck crane and lowered into the trench.

Among the interesting features in the November issue of CONTRACTORS AND ENGINEERS MONTHLY *will be a description of building* 4.6 *miles of penetration macadam without interrupting traffic.*



METHODS OF HAULING AND HANDLING COATED PIPE

1. At left the mattress or cushion used to prevent the pipe from being injured by contact with each other or the truck. At right, the sling used by the crane in lowering the welded sections into the trench. 2. Loading the pipe onto a truck for transportation to the trench. Note the position of the mattresses. 3 and 4. Lowering a 120-foot section of the welded steel gas pipe into the ground using the special slings.

Giant Mixers for Continuous Service

Pioneering leadership, always typical of Ransome is shown in these "big" mixers, designed as a permanent tool for continuous operation on large construction jobs, central mixing plants and for use in industrial plants and the mining field.

To develop mixers of this size and capacity called for long experience. Ransome had this experience. It called for foresight. Ransome had such vision. It drew upon a rare degree of engineering genius. Ransome possessed the necessary skill.

"Big" mixers, as built by Ransome, fill a vital need. They are real tools —permanent tools—and considered as such by their users.

Get this New Ransome Bulletin

Then you will have the complete story—illustrated with interesting pictures and full descriptions of parts and the many typical Ransome features.

A glance through this Bulletin will prove the great contribution made by Ransome to mixing problems. May we send you a copy?

Ransome Concrete Machinery Company

1850—Service for 79 Years—1929

Dunellen **New Jersey**

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Liability for Injury Must Be Proved

A small boy found three dynamite caps—two in a field adjoining a road and one along the roadside. He took them home and his seven-year-old brother was injured in attempting to sever a wire from one of the caps. Defendant contracting company had previously completed construction of the work and had used similar caps in blasting operations. But afterwards an electric light company placed a line along the highway and there was evidence tending to show that it had used similar caps.

Holding that the defendant company was not shown to have been liable for the accident, the Pennsylvania Supreme Court said in an opinion handed down November 26, 1928, in the case of Cain vs. Booth & Flinn, Ltd., 144 Atl. Rep. 286:

"We may assume that whoever left these dangerous explosives where they could fall into the hands of children was negligent, but our question is as to the culpable party. Of course, negligence may be established by circumstantial evidence, where it creates a reasonable probability of the defendants' fault, and excludes every other reasonable cause. . . .

"A party is not liable for a wrong because it must have been committeed by himself or by some one else. The defendants are not liable because either they or some other party left the dynamite caps exposed. Where dynamite is in so many hands in the immediate locality, the mere finding of caps in an open field, without more, is not sufficient to fasten liability upon any one. . . . It is unfortunate that dynamite caps, made by many companies, without means of identification, are sold without restraint. This renders it difficult to fix responsibility for their careless handling. In the instant case the fault may have been that of the defendants, as so ably urged by plaintiff's counsel, but, as other reasonably possible causes were not eliminated, the finding to that effect was a mere guess, and cannot be sustained."

A Legal Phase of Lending Employees

Where a steam crane and an engineer were temporarily furnished by the owner of the crane, the engineer became temporarily an employee of the borrower in such sense as to make the latter liable to him under the Illinois Workmen's Compensation Act for injury arising in the course of the temporary employment. In reaching this conclusion in the case of Allen-Garcia Co. vs. Industrial Commission, 166 N. E. 78, decided by the Illinois Supreme Court April 20, 1929, that tribunal said:

"At common law an employee in the general employment of one person, may, with his consent, be lent to another for the performance of special work and become the employee of the person to whom he is lent while performing such special service. . . . This same principle of law applies to cases arising under the Workmen's Compensation Act. . . . The test whether or not the workman, in the performance of the special work for which he is lent, becomes the employee of the person to whom he is lent, is whether or not he becomes for the time being wholly subject to the control and direction of the person to whom he is lent for the special service being performed and freed during such time from the direction of his master."

Contractor Was Entitled to Additional Pay for Constructing Approaches to Bridge

The case of McDonald vs. New Sewickley Township, 144 Atl. 420, decided by the Pennsylvania Supreme Court November 26, 1928, involved the right of a bridge contractor to extra pay for filing approaches. Reversing a previous contrary conclusion, the Supreme Court said:

"Admittedly plaintiff placed 'fill on the approaches, in excess of the materials excavated from the foundations,' and for so doing now claims to be paid 'at the price bid per cubic yard.' The foregoing review of the contract and of its incorporated documents shows that this was additional work. With much doubt, the court below reached an opposite conclusion because of a general statement in plaintiff's proposal, whereby he offered to 'erect or construct, complete, ready for travel, a bridge as shown on the plan and described in the specifications.' The words 'ready for travel' bear the entire weight of his argument. We have already shown, however, that the proposal is not a part of the contract, and hence, of course, cannot enlarge or diminish the rights of the parties. True, the contract itself requires plaintiff to 'construct and complete . . . a concrete and steel bridge'—language which, if it stood alone, might well be held to include the 'fill on the approaches.' . . . It does not stand alone, however; on the contrary, the presumption of inclusion which might otherwise have arisen is wholly destroyed by the express provision that the township shall pay additionally for the 'fill on the approaches, in excess of the materials excavated from the foundations.' These words are clear and unambiguous, and their manifest effect cannot be overcome by an antagonistic presumption, for this must always give way to that which is expressed.

"Appellee (the township) also founds an argument on the fact that at the bottom of the plan are the words 'Earth Fill 2250 C. Y.,' which is the number of cubic yards for which plaintiff claims to be paid as additional work. Nothing on the plan connects these words with the intended contract for constructing the bridge for a gross sum. For all that appears on the plan, they may have been placed on it in order to enlighten the supervisors and bidders as to the probable extent of the 'fill on the approaches' which was to be paid for as extra work according to the unit price bid. Certainly they cannot be so constructed as to override the express language of the contract, above quoted, which declares this shall be additional work."

Contractor's Rights on Abandoning Work

Where a contractor or subcontractor inexcusably fails to perform, or substantially perform, his contract, he thereby deprives himself of the right to compensation specified in his agreement. But that will not prevent his recovering the reasonable value of the work done, less damages sustained by the owner through breach of the contract. The opinion filed by the Iowa Supreme Court April 5, 1929, in the case of Goben vs. Des Moines Asphalt Paving Co., 224 North Western Reporter, 785, to this effect is in line with what courts throughout the country generally hold.

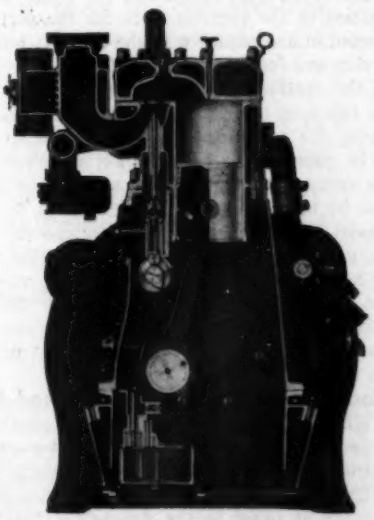
PERFECT ALIGNMENT

NON-ROCKING CYLINDERS

THE truncated cylinder mounting in Waukesha Super-duty Industrial Engines is made possible by the deep, rigid "girder" type crankcase. The outer crankcase wall comes half-way up the cylinder barrel. The cylinder's supporting flange is at the base of the water space... nearly opposite the point of greatest side thrust. Cylinder rocking, leaky oil joints and imperfect alignments are eliminated. ¶ Many other exclusive features are explained in Bulletin 581. Write *Industrial Equipment Division, Waukesha Motor Company, Waukesha, Wisconsin. Offices: New York, 8 West 40th Street; San Francisco, 7 Front Street.*

WAUKESHA ENGINES

973



Cross Section of 4-Cylinder Super-Duty Waukesha Engine.

Breach of a Construction Contract Cannot Be Enjoined

Although the law does not sanction an owner's breach of a contract by dismissing a contractor without just cause, nor the act of the contractor in quitting without good reason, construction contracts are governed by the general rule that the courts will not enjoin a breach of an ordinary contract. There are exceptions to that rule, but they do not apply to construction contracts, agreements for sale and purchase of goods, etc.

And an opinion handed down by the Washington Supreme Court December 31, 1928, in the case of Boyer vs. City of Yakima, 273 Pac. 188, shows that the general rule applies to contracts for public work. In that case the court dismissed a suit to enjoin defendant city from terminating a contract with plaintiff for construction of a concrete reservoir. The court applied the rule laid down in the following extract from Donnelly's Law of Public Contracts, sec. 313:

"A contractor cannot compel a public body to continue in the work of construction of a building or other structures. A public body, just as an individual, may abandon an enterprise which it has undertaken and refuse to allow a contractor to proceed; it may make a new contract or complete the work itself without there being any default on the part of the contractor. But while it is free to violate the contract, while it may refuse to perform or arrest performance it can in no way destroy or get rid of the obligation of the contract. The original contractor has his claim for damages which in the case of the state or nation the Legislature or Congress would doubtless recognize or in those instances where the right to sue has been conferred, the contractor may sue and recover his damages, including prospective profits where the public body prevents performance. While the contract is executory, a public body has the power to stop performance on the other side by an explicit direction to that effect, subjecting itself to such damages as will compensate the contractor for being stopped in the performance on his part at that particular stage of the work. The party thus forbidden cannot go on afterwards and increase the damage. In such case the just claims of the contractor are satisfied when he is fully recompensed for his part performance and indemnified for his loss in respect to the part left unexecuted. The refusal to permit further performance is not a secession of the contract but simply a breach for which in an appropriate action he is entitled to recover these damages.

"Where the contract is partly performed and the contractor is prevented from completing the remainder, the contractor is entitled to the contract price for the part which he has performed in accordance with the contract rate, and he is entitled to damages for being prevented from completing the remainder of the contract. Consequently the items which chiefly make up this loss, the outlays which were reasonably made in preparing for performance and the expected profits which were to be gained from performance, are elements of damage and are recoverable as such. In addition to these chief items of loss he may recover such other items as are included in his special loss. For instance, he may recover a fair allowance for his own time, and where he has brought material to the site or has it on hand for the contract, he may have any loss that has resulted to him thereon. Where the expense connected with getting ready to perform is about the same as actual performance, he may recover the contract price."

Conflicts in Contracts on Printed Forms

Where a contract is executed on a printed form and there is a contradiction between printed clauses and the parts that are written, it will be presumed by the courts that the parties mutually intended that the written portions should govern, in the absence of proof to the contrary. That principle which has often been stated by the courts was recognized by the United States Circuit Court of Appeals, Fifth Circuit, in the case of Pacific Rice Mills vs. Westfeldt, 31 Fed. 2d, 979, decided April 15, 1929.

Blacklisting Former Employees Is Hazardous Business

A stone company notified contractors that the company would not sell stone to any one who would hire plaintiff, a stone-cutter formerly in the company's employment. Claiming that he was discharged solely because he a member of a labor union, and that this black-listing of him prevented his securing other employment, he sued the stone company for damages. Thus it happened that the North Carolina Supreme Court was called upon to determine whether or not such action on the part of the former employer was actionable. Holding that it was, under the blacklisting statute, the court said in the case of Coins vs. Sargent, 146 S. E. 131:

"It is . . . held that the statutes do not attempt to interfere with the right of an employer to discharge an employee for cause, or without cause. They do not seek to prohibit an employer from communicating to other employers the nature and character of their employees, when the facts would be for their interest. . . .

"By virtue of the statute, plaintiff is not required to allege or prove malice or actual damages; both are presumed. The General Assembly of this state evidently thought it just to relieve discharged employees, who were prevented by former employers from obtaining employment by other persons, firms or corporations, by notice of the fact and ground for the discharge, *without request*, of the burden of proving either malice or actual damages. The right of a prospective employer to obtain from former employers truthful statements as to the ground of the discharge is fully safeguarded by the provisions of the statute.'

Sewer Contractor Held Liable for Subsidence of Property

Because parts of lots subsided as a result of sewer construction, and because it was found that the fault lay with the contractor—not with the plan of the work—the California District Court of Appeal held that he was liable for the damage sustained by the owners of the lots. In an opinion filed December 10, 1928, the court said in this case (Kaufman vs. Tomich, 272 Pac. 1082), reversing a judgment of a lower court:

"I think the damage to plaintiff's property was caused by the negligence of the contractor in failing to carry out faithfully the specifications and not by the public works as planned, specified, and contemplated. It could have been executed without harm to plaintiff, if proper care was used by the contractor; and so it was not the public work, but the manner of executing that public work by the contractor, which damaged the plaintiff. Although the specifications called for bracing, yet, quoting from respondent's brief, 'it clearly appears that no bracing or protection of plaintiff's wall was taken until after the damage had occurred.' In the authorities relied upon by respondent for upholding the liability of the municipality, the damage resulted from the very nature of the improvement as planned. . . .

"The public work planned and ordered was to open and close the street, again restoring it to its former state in good order. The work as planned, then, would do no harm to plaintiff; but the city is held liable by the judgment [of the court below], because the work as located and aligned was inherently dangerous—inherently wrong and of such a nature as was likely to damage and injure plaintiff's property. If the judgment is correct, then the municipality is responsible at all events for damages caused by the contractor if the work planned is dangerous, but not if the work is not dangerous inherently. No such distinction has been drawn in the authorities between dangerous work and safe work. The amount of danger only determines the amount of care required in executing the work."

Concrete Bridge Deck *Perfectly Cured by "Hunt Process"*

ON bridge No. 5311 of U. S. Highway 99 (California State Highway No. 4), results of the "*Hunt Process*" cure have exceeded even the highest hopes of engineers.

Replacing the old structure over the Santa Clara River which was swept away by the St. Francis dam break, this swayback type bridge is 410 feet long with five 82-foot plate girder spans. The re-inforced concrete deck is 7 inches thick and width, 42 feet including a 4-foot sidewalk.

On jobs like this or any other form of concrete work, "*Hunt Process*" is the best bet when you come to the curing! A single, simple operation and the job's done. No sprinkling—no ponds to make—dirt or straw to remove! A two-man crew is sufficient for the largest job. Prevents hair-checking and subsequent scaling while it increases the compressive strength and resistance to abrasion.

"*Hunt Process*" has cured more than 8,000,000 sq. yds. of pavement and is now an accepted method among various U. S. Governmental departments, many states, counties and cities throughout the entire country. We will be glad to send you one or all of the booklets which you check below.

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☐ *"Protecting Pipe Lines and Exposed Metal Surfaces with McEverlast Protective Coatings."*
☐ *"Controlling the Activities of the Termite."*

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Address_____

C&EM-10-29

Construction Industry News

Independent Pneumatic Tool Co., Chicago, Ill., has announced the election of Ralph S. Cooper to the office of President to fill the vacancy caused by the death of John D. Hurley on August 15. Mr. Cooper was graduated from Cornell in 1903 as a Mechanical Engineer and immediately joined the late Mr. Hurley with whom he was associated for over 26 years. Mr. Cooper was a member of the Sales Department in Pittsburgh, then moved to New York as Manager of the New York office and later became Eastern Manager. In 1917 he was elected Vice President in charge of Eastern Sales and early in 1918 was transferred to Chicago as Vice President and General Sales Manager. Mr. Cooper spent 1920 and 1921 in Europe, opening the company's office in Great Britain and establishing Thor agencies throughout the continent. On his return in 1921 he became also General Manager in charge of all departments of the company, which work he has carried on for the last 8 years.

Paradon Mfg. Co., Arlington, N. J., has announced the appointment of William H. Fulton as Chief Engineer of the company. Mr. Fulton will have full charge of the design and development of Paradon chlorinating apparatus and other projects of the company.

General Excavator Co., Marion, Ohio, manufacturer of convertible ½-yard shovels, is now powering all its machines with a standard make 6-cylinder engine, which is designed to assure reserve power and smooth operation.

The Central Iron & Steel Co., Harrisburg, Pa., manufacturer of Central Knobby non-skid floor plate and steel sheets and stampings, has announced a change in the address of their Boston office from 131 State St., to the Statler Office Building, Park Square. G. T. Armstrong is still in charge of this office.

DeWalt Products Corp., Leola, Pa., has announced the addition to its organization of Walter Knapp, as Executive Engineer of the plant. Mr. Knapp is a Mechanical Engineer, graduated from Cornell University, and has had many years' experience in plant engineering in all of its phases, including research engineering, design development, production and personnel management.

International Cement Corp., New York, has announced that the **Lone Star Cement Co., Virginia, Inc.**, South Norwalk, Va., a subsidiary, recently launched an all-steel self-loading barge for transporting bulk cement from the company's South Norwalk mill to its Washington, D. C., warehouse. The barge is 163 feet in length and has a beam of 37 feet 4 inches with a total capacity of 5,600 barrels of cement. The use of such a barge makes it possible for the Lone Star Cement Co., not only to extend its activities but also provides a most economical means of transporting the cement to its warehouse in Washington.

The Trackson Co., 500 Clinton St., Milwaukee, Wis., has announced the appointment of Z. T. Darrow & Son, Canandaigua, N. Y., as distributors for the McCormick-Deering industrial tractor and the Trackson line of Full-Crawlers, shovels, loaders, cranes, bulldozers and other contractors' equipment.

Another appointment is that of L. A. Snow Co., 134 International Right of Way, Spokane, Wash., as a distributor of Trackson tractor equipment for McCormick-Deering tractors. The new distributor will cover the Spokane territory and will be able to fill orders and furnish repair parts promptly. Don E. Lillie is manager of L. A. Snow Co.

The Gardner-Denver Co. has announced that contracts were let during the week of September 9 for a new addition to its Quincy, Ill., plant, which will give a 50 per cent increase in production. The addition is to be completed in 90 days. Ralph G. Gardner, Vice-President, announced that the unfilled orders of the company have not diminished and with the additional manufacturing space this fall, production will soon be nearer the sales demand.

Hibbard S. Greene, former Vice-President and Director of the Barber-Greene Co., Aurora, Ill., has been appointed Assistant to the President of the Chain Belt Co., Milwaukee, Wis. Mr. Greene's duties will be to coordinate the marketing plans of the Chain Belt Co., Sivyer Steel Casting Co., Federal Malleable Co., and the Interstate Drop Forge Co., all of Milwaukee, as well as the Stearns Conveyor Co. of Cleveland, Ohio., the latter company being a division of the Chain Belt Co.

The Edson Mfg. Co., makers of portable diaphragm pumps, has moved to its new building, at 49-51 D Street, South Boston, Mass. This is the second move this company has made in ten years, both moves being made necessary to take care of increasing business.

The New Detroit Plant of the Hunter Machinery Co., Since it Was Doubled Last Fall. It Is All Brick, Concrete and Steel, with a 150-foot Front and Located on a Side Track of the Michigan Central Railroad Where an Unloading Crane Is Maintained

LITTLE TIME and lots to do—

OCTOBER finds the highway official busy with urgent jobs that need doing before Winter sets in.

Roads to be surface-treated—especially those that will be plowed when the snow falls; weak spots to be patched before they become bad spots; last-minute rush jobs to be completed . . .

Tarvia, plus Barrett's speedy and dependable service, are immediately available for the prompt completion of this important work.

Take advantage of the few remaining favorable days. The Tarvia field man is ready to help you. 'Phone, wire or write our nearest office.

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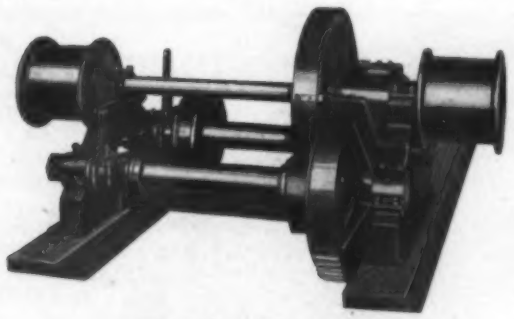
FOR ROAD CONSTRUCTION
REPAIR and MAINTENANCE



The Brown Boom Swinger

Boom Swinger for Steel Erection and Material Handling

THE uses for a practical, efficient boom swinger are many, including steel erection in buildings and bridges, stone setting, or derrick work in rehandling materials, loading and unloading, dredging, and so forth. To meet the demand for such a piece of equipment, the Brown Clutch Co., Sandusky, Ohio, has developed the Brown boom swinger with an exclusive bronze screw thrust and positive clutch release control, which permit easy control and adjustment, particularly where banked lever controls are employed. This boom swinger is manufactured in two sizes, the larger for use with the Model-40 series Brown hoist and a smaller size for the Model-30 series.

The drive for the boom swinger is taken directly from the forward drum cone gear of the hoist in mesh with the swinger gear, which is machined to receive the asbestos-lined cone clutch integral with the pinion. The swinger gear is keyed and set screwed to a shaft running through a sleeve, and is always in motion. The cone clutch and pinion are bolted to the sleeve and controlled through the bronze screw and positive release plate, which actually pulls the clutch out of engagement instead of depending upon a spring. The positive release plate eliminates a possibility of the clutch dragging or the clashing of gears.

When the operating lever is perpendicular the boom swinger is in neutral. Upon pulling the lever toward the power end of the hoist, the cone clutch is engaged and power is applied on the pinion, which transmits it to a gear keyed and set screwed to the shaft, applying the power to this shaft in counter-clockwise rotation. The turn-table or bull-wheel cable is wound up on one drum and automatically unwinds on the other drum.

As the control lever is brought forward through neutral, the cone clutch is released. Upon pushing the lever forward beyond neutral, another clutch is engaged applying power through the forward sleeve and the attached pinion to the swinger gear, which now applies power in clockwise rotation and upon the drum at the end opposite to that first engaged, reversing the motion of the derrick. The cable is wound over the top of one swinger drum and under the swinger drum on the opposite side.

The double-flanged, asbestos-lined brake is controlled by a foot lever easily accessible to the operator, the brake functioning regardless of the direction of rotation of the swinger.

The left-hand swinger boom is provided with four keyways, the cable being fastened to the opposite drum, around the turn-table and back to the left drum. The key is removed, slack cable taken up on the drum and the key inserted in the nearest keyway, and it is ready for operation.

All gearing is 3¼-inch face, 2½ diametrical pitch nickel alloy semi-steel and machine cut, with the exception of the pinions and one gear which operate at slow speed and are cast. The drums are 12 inches in diameter and 10 inches between flanges, the flanges being 1½ inches high. The drum shaft is 2 15/16 inches in diameter and the sleeve shafts 2½ inches. The line speed is approximately 40 feet per minute. Both sleeves are fitted with heavy bronze bushings. All bearings have Alemite high-pressure lubrication.

A One-Man Excavating, Loading and Screening Plant

A UNIQUE one-man excavating, loading and screening plant has recently been developed by Barber-Greene Co., Aurora, Ill. The plant is a complete unit, self-propelled, self-loading and self-contained, which was developed by combining a Leahy-Deister screen and a Barber-Greene Model 42 bucket loader, with slight modifications of both.

The bucket loader has the standard B-G features including the automatic safety sprocket which stops the bucket line when the bank caves too much, the full crawler mounting with three-point suspension and the disc feed. When the bucket loader throws the gravel into the screen, it throws first against a deflector which serves the purpose of breaking the impact of the discharge, and spreading the material before it hits the primary screen.

This screen is a heavy square mesh screen inverted over the main screen like a roof and vibrated by a take-off arm from the same drive that vibrates the main screen. This primary screen spreads the material again to insure better separation by the main screen below, and retains the oversize. The oversize material is rejected through two chutes, one on either side of the screen, onto the conveyor which runs beneath the main screen and is discharged at a point 8 feet 2 inches from the center of the machine and 7 feet 5 inches above the ground.

After the material has been shaken through the primary screen, it falls onto the main screen, a 4 x 5-foot fine-mesh screen, vibrated at 1,600-vpm by the bucket loader power unit. This screen is made in several mesh sizes and can be set at an angle from 28 to 35 degrees by a lever within the reach of this operator. The material selected by this screen is chuted off directly behind the loader into trucks, the fines which fall through it drop onto the conveyor and are carried off with the oversize. In case sand is desired, a gate in the mouth of each of the oversized spouts is flopped open, allowing the oversize to fall direct to the ground instead of falling on the conveyor. Then, since the smaller gravel is thrown off by the main screen, and the oversize is dropped through the spouts to the ground, the conveyor carries nothing but sand to the truck on the side of the plant.

The Barber-Greene One-Man Loading and Screening Plant

*Points to consider in selecting culverts and drains . . . No. 5**

All costs lowered

by selecting Armco Culverts

Culvert economy is relative . . . and progressive. To know the lowest costs, comparisons must be made. And they must lead through the life of the culvert.

Armco Culvert buyers are usually thorough men. They have considered everything involved in getting the culvert installed. They have weighed the expenses of maintaining permanent culvert service.

And they have selected Armco Culverts on the service records offered by actual installations.

Consider the economies indicated by the above illustrations and you will find yourself becoming more and more Armco-minded when culverts are to be selected.

Let us supply you with confirming data.

ARMCO CULVERT MANUFACTURERS ASSOCIATION
Middletown, Ohio

Armco culverts and drains are manufactured from the Armco Ingot Iron of The American Rolling Mill Company and always bear its brand

ARMCO CULVERTS

"Look under your roads"

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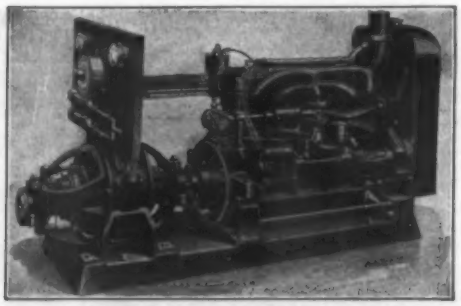
*No. 6 of this series appears in December



A Stationary Gasolectric Set of 10 to 40 kw.

Portable Light and Power Plants

A LINE of light-weight, portable light and power plants which may be used to supply electricity or power for floodlights, tools, magnets, compressors, electric motors, or for the illumination of construction camps where local power is not available, is being made by the Modern Equipment Co., McIllwraith Street, Muskegon Heights, Muskegon, Mich. These Gasolectric units consist of a gasoline engine direct-connected to a specially wound generator so as to furnish electric current as long as the engine is in operation, each unit being supplied with an effective cooling system and all necessary accessories.

The smaller sizes are all powered with Briggs & Stratton air-cooled engines and connected direct to a Westinghouse specially wound generator, no batteries of any kind being used. The power generated is 110-volt, D. C., permitting the contractor to use any standard bulbs or fixtures. The smallest set will take care of 9 or 10 lights of 15 watts each, this amount being ample for a small construction camp. A complete line is available up to a large 50-kilowatt portable set.

The units may be started by a geared foot starter, which revolves the engine several times, or by a push button placed in a convenient location. A standard automobile battery is supplied to operate the starter, the battery being charged while the unit is in operation. The speed of the engine and the voltage of the generator are automatic in their operation and require no adjustment.

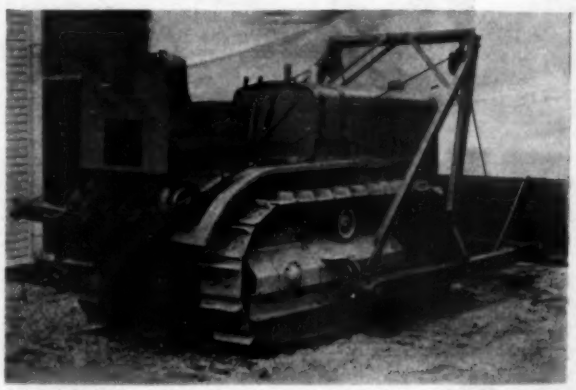
A 350-watt unit uses one quart of gasoline for each 2½ hours of operation at full load, and the 800-watt size uses one quart each 1 1/3 hours.

If desired, a Gasolectric pump may be attached to the unit, so that water may be pumped during the day and the same unit used for lights at night. These single acting plunger pumps are located on an extension base attached to the unit and driven by a belt which is tightened by an adjustable pulley. All pumps have bronze plunger, bronze ring oiled bearings, automatic connecting rod bearing oiler, bronze valve seats and ample air chambers to insure steady operation. The pump will take water from a point 20 feet below and discharge it at a height of 170 feet or 75 pounds pressure.

A Larger Foot-Started Gasolectric 1½-Horsepower Engine

A New Tractor Power Winch and Bulldozer

A NEW tractor power winch and bulldozer for Models Ten, Fifteen and Twenty Caterpillar tractors has been announced by the Miami Trailer Scraper Co., Troy, Ohio. The Miami power winch attaches direct to the tractor housing in a one-piece casting, driving direct from the upper transmission shaft through a pair of beveled gears. The drum of the Ten and Fifteen has a capacity of 160 feet and the Twenty, 300 feet of ⅜-inch cable at a speed of 90 feet per minute.



Miami Winch and Power-Operated Bulldozer Mounted on a Tractor

The winch mounted on the tractor provides power winch operation for the Miami one-man power scraper and the power operated bulldozer, which is attached by means of specially designed axle ends, using holes already drilled in the track frame channels. This method of mounting the bulldozer leaves the tractor drawbar entirely free for hauling. The large bulldozer blade is carried by H-beams and is raised and lowered by the tractor driver by two steel cables attached at the ends to insure an even lift when only one end of the blade is under load. It is equipped with rub plates to eliminate all side movement.

Another feature is the mounting of the cable-carrying frame by means of a universal connection direct to the track frame, allowing the blade to follow the ground contour and minimizing any tendency of the blade to gouge. The entire unit can quickly be mounted on the tractor in the field.

Chinese Engineers to Attend Road Show

CONSIDERABLE interest is being shown in the highway situation in China and as there are so many miles of road to be built, the engineers are particularly interested in speed and machinery for road construction rather than the coolie labor which has been used heretofore.

With this in mind, it is expected that a delegation of engineers representing the Chinese Government and the different provinces will attend the American Road Builders Convention which will be held at Atlantic City next January, in order to become acquainted with the newest equipment.

Massachusetts State Highway, Boston to Newburyport. Asphalt Macadam construction with SOCONY Asphalt Binder in 1923. This view taken in October, 1928, after carrying heavy traffic for five years without repairs or resurfacing.

Standard Asphalt Products

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(Socony Brand)
for surface treatment

Standard Asphalt Binder B
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for penetration work

Standard Asphalt Binder C
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(Socony Brand)
for brick or black pavements

Standard Cold Patch Asphalt
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Model BU Chicago Automatic Material Unloader

A New Material Loader

A NEW material loader, known as Model BU, has recently been developed by the Chicago Automatic Conveyor Co., 1853 South 55th Avenue, Cicero, Ill., for use in unloading sand, gravel and crushed stone from cars without the necessity of a pit.

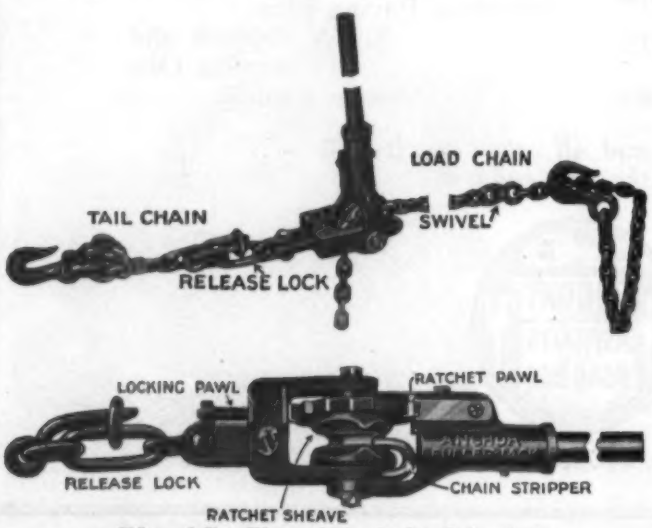
This loader consists of a horizontal belt conveyor 12 feet long which sets flush across the rails and unloads from both sides of the car. This loader can handle material at the rate of 60 yards an hour. It is powered by either a gasoline engine or electric motor.

A Light Weight Puller-Jack

A NEW device has been brought out to handle the jobs of pulling, moving and lifting heavy loads. The Anchor Puller-Jack which has a shipping weight of only 82 pounds is manufactured by the T. H. Edelblute Co., Oliver Building, Pittsburgh, Pa. A standard outfit consists of the ratchet-jack itself with a 3-foot steel handle, 15 feet of load chain with a slip hook and swivel and 3½ feet of tail chain with a grab hook and also the sheave block. The sheave block is used to double the pulling power or, in making vertical lifts, pulling around corners or in cramped quarters. The chains are made of high carbon steel heat treated and provide a factor of safety and will not stretch out of shape.

With this equipment, it is possible to pull the entire length of the load chain without taking a new hold. A 15-foot chain is standard equipment, but longer lengths may be used. A quick release lock makes it possible to release instantly the load under full strain. Certified tests by the Pittsburgh Testing Laboratories show that the Puller-Jack on a straight line pull can exert 4,800 pounds with one man on the lever and 6,500 pounds with two men. With the Puller-Jack equipped with the sheave block, one man pulled 6,700 pounds and two men 9,800 pounds. These tests were made with a standard Anchor Puller-Jack equipped with the standard 3-foot lever and the men stood on a concrete floor. Out on the job, men can dig in their feet and get a real pull.

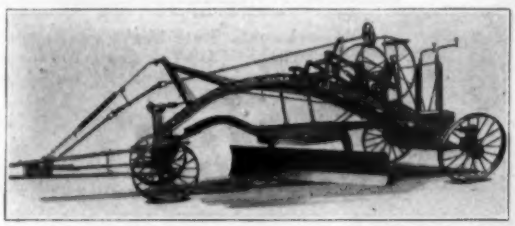
Among the jobs which have been readily handled with this small piece of equipment are: pulling structural steel members together, pulling forms together on concrete work, tightening guy wires on derricks, pulling loaded trucks out of a ditch, moving industrial track in quarries and pits, pulling broken conveyors together for splicing, moving heavy loads into unusual positions, lifting heavy machinery, spotting railroad cars and loading and unloading heavy machinery.



Side and Top Views of the Anchor Puller-Jack

An 8-Foot Grader with Telescopic Rear Axle

A NEW Giant 8-foot leaning wheel grader with a two-piece telescopic rear axle has recently been developed by Austin-Western Road Machinery Co., 400 North Michigan Avenue, Chicago, Ill., to meet the needs of public officials and contractors. This latest model Giant grader is light enough to be handled by horses but is generally used behind a medium sized tractor, and when so used, is fitted with the improved offset engine hitch which operates under all conditions.



The Austin Grader with Telescopic Rear Axle

One of the features of this leaning wheel grader is the telescopic rear axle, which makes it possible for the operator to set his blade where he wants it without the possibility of one of his rear wheels running in the loose dirt. It is also important on bank work as it permits the operator to place the rear wheels where he wants them, out of the way of bushes, fence posts or telephone poles. Because of its telescopic axle and axle cage, the rear truck of the grader is so heavy that its weight alone helps to prevent a tendency to slide.

The improved steerable offset engine hitch is composed of a heavy 5-inch upper channel and 4-inch lower channel fastened together at the front by a sturdy connection, and at the rear by a strong strut. Steering is accomplished by a worm and gear carried in a bracket bolted to the pole near its middle, the bracket also acting as an additional strut between the upper and lower channels. A high grade roller chain is used for steering, and adjustments are provided at both ends of the steering chain rods for taking up wear. The pole is connected directly to the king pin, and revolves around it in steering, with the result that steering is not affected by the pull of the tractor transmitted through the pole. The pole is connected to the front truck, rather than to the grader frame, to permit free vertical movement of the front end of the pole without interfering with or straining the frame. The main function of the lower channel is to pull the truck, the upper

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channel doing most of the heavy draft work.

Another feature of the grader is that the front end of the arched frame is brought down close to the fifth wheel, while the power applied through the pole is transmitted in practically a direct line to the blade. The broad fifth wheel is of great assistance to the main frame in controlling frame twist, which is the tendency for one frame rail to be raised when the point of the blade is forced into a hard surface.

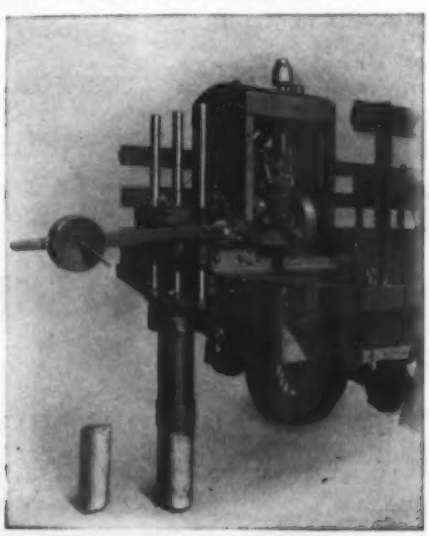
In the blade lifting mechanism, the bell cranks are set closer to the frame than in former models, which makes possible an almost unbreakable construction. The bell crank shaft is made of high carbon steel, 1¾ inches in diameter, hardened at both ends to support the bell cranks and held in place by heavy clamp bolts. The bell cranks are held in place by nuts which can be adjusted to take up wear. The blade lifting arms connecting the circle and bell cranks are provided with machined sockets at each end, and shims between the caps and the main part of the sockets for taking up wear. The 2-inch balls that fit in these sockets are accurately machined and held in place by ¾-inch bolts driven into reamed holes. The cast steel sockets are threaded to the 1¾-inch high carbon cold rolled steel lifting arms, the threads on the arms permitting a certain amount of adjustment as regards length.

This grader with the offset engine hitch weighs 4,745 pounds, the height of the frame being 53 inches above the ground. The blade is 8 feet long, 17 inches wide and ½-inch thick. It may be provided with a scarifier attachment or a combination back sloper if desired.

An Improved Pavement Tester

WITH the rapid increase in the mileage of concrete highways and streets throughout the country and the speed of constructing these highways, it has become a necessity for contractors and municipal, county and state officials to have some convenient means of taking samples of complete pavement at proper intervals along the road or street. The core test affords this means. A new pavement drill or tester which provides a core giving an exact sample of the pavement at the point removed, thus showing a complete cross section of each layer of the foundation, coarse and fine concrete surfacing, is manufactured by the Sullivan Machinery Co., 400 North Michigan Avenue, Chicago, Ill.

The standard bit removes a core 5¾ inches in diameter and



Sullivan Type 2 Pavement Tester with Engine, Mounted on a Motor Truck

Cores Removed with Sullivan Pavement Tester. Left, Old Hard Concrete; Center, Asphalt Top on Concrete with Binder; Right, Reinforced Concrete, with Steel Reinforcing Showing as Dark Spots Near Center

cuts a hole about 7 inches across. A pavement 7 inches in thickness can be penetrated in 7 minutes, and a core can be removed at the rate of 1 foot in 15 or 20 minutes. With core barrels of ordinary length, this machine will drill to a depth of 24 inches. A steel core barrel, slotted at the bottom, and chilled steel shot are the means employed for taking the core. The core barrel is fed downward by a rotating drive rod, giving a speed varying from 40 to 50 rpm for starting and up to 100 to 150 rpm while regularly drilling. The drive rod is supported by ball bearings carried in a yoke, and is driven by the engine through beveled steel gearing. A 10-horsepower twin cylinder, water cooled, gasoline engine furnishes power.

This machine is adapted to any class of concrete pavement, whether the pavement is old or new, plain or with reinforcing steel. Any type of surfacing material, including asphalt, may be tested with this drill, which is operated with a gasoline engine and weighs complete slightly less than 900 pounds. It is arranged for mounting on the rear end of a light motor truck.

Demolition to Be Made Safer in Washington, D. C.

AN amendment to the building regulations of the District of Columbia has been recently made by the District commissioners. By the terms of this amendment, the owner, as well as the contractor in charge of demolishing a building, must provide sufficient safeguards for the workmen. When buildings more than three stories in height are to be wrecked, the regulation requires that the owner must employ a special inspector who must be approved by the Inspector of Buildings of the District. It is the duty of this inspector to see that the work of demolition is carried on in strict accordance with the District regulations.

Necessary safeguards must consist of such props, posts, braces, stages, platforms and scaffolding as may be necessary to provide sufficient strength and rigidity to the portions of the building being taken down or removed to insure the safety of the workmen employed.

"Razing shall begin at the top of the structure and proceed downward. No wall, beam, column or the like supporting any load shall be disturbed or weakened until the load has been entirely removed. All masonry walls shall be removed unit by unit and in a manner approved by the Inspector of Buildings. All loosened material and debris shall be removed from time to time as not to accumulate in such quantity or such weight as may overload any floor, platform or scaffold. Plain or reinforced concrete structures shall be razed in such manner as is approved by the Inspector of Buildings.

"No structure or portion thereof being demolished or declared to be dangerous under the provisions of Section 1, Part 1, of the building regulations shall be thrown, pulled or blasted unless special approval is given by the Inspector of Buildings upon application in writing by the owner or his agent to do so."

Newark

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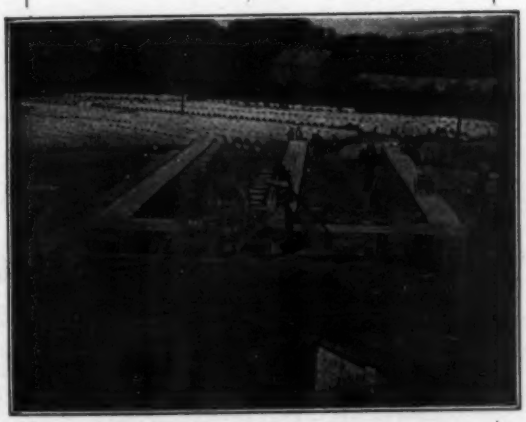

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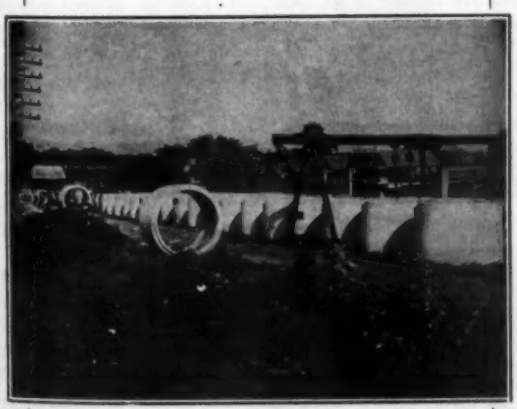

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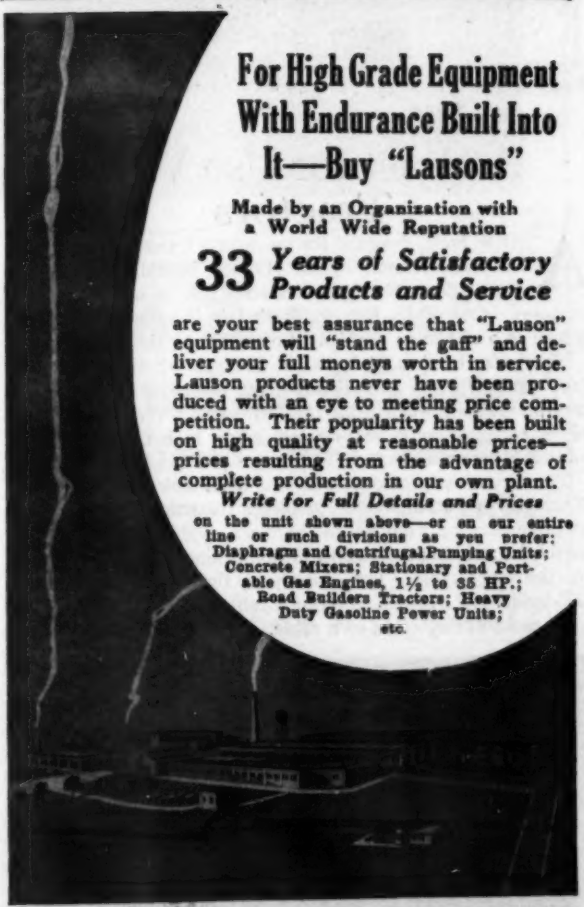

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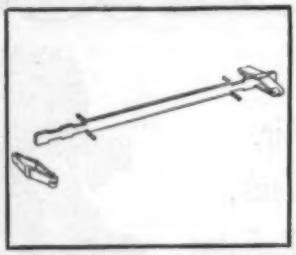
on the unit shown above—or on our entire line or such divisions as you prefer: Diaphragm and Centrifugal Pumping Units; Concrete Mixers; Stationary and Portable Gas Engines, 1½ to 35 HP.; Road Builders Tractors; Heavy Duty Gasoline Power Units; etc.

THE JOHN LAUSON MFG. CO.

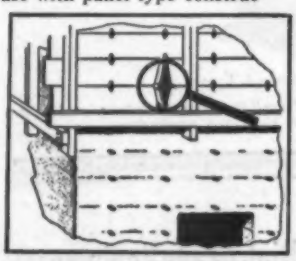
11 Jackson St., New Holstein, Wis.

A Concrete Tie and Spacer With Detachable Head

TO meet the special demand for removable head tie, the American Form-Hold Corp., 801 Universal Bldg., Los Angeles, Calif., who has recently taken over all of the interests and plant of the Concrete Form-Hold Corp., has developed the Red-Head concrete tie and spacer, which has detachable heads which make it very economical to use with panel type construction where the forms are moved in sections from floor to floor. The heads which represent about 25 per cent of the cost of the device may be saved and used again.



Detachable Head of Tie and Spacer



Panel Construction of Tie and Spacer

Besides making a large saving in labor, these ties replace tie wire, wood spacer blocks and a large part of the studs, wales and bracing used in concrete form erection.

A Hoist for Use With Tractors

A NEW hoist, designed for use with a Caterpillar Twenty, is manufactured by the Luther Manufacturing Co., Inc., Olean, N. Y., and is adaptable to many hoisting purposes. One of its features is that it is so guarded as to reduce to a minimum the danger of injury to the operator.

The brake band is 24 inches in diameter by 4 inches wide, lined with asbestos brake band lining and well supported to prevent dragging when using the free spool. The power take-off is equipped with heat-treated gears, is ball bearing and lubricated by an oil bath.

The drum is provided with an adjustable steel divider. When this is placed about 12½ inches from the flange, 52 feet of cable may be wrapped on the drum, one layer around the barrel, leaving ample space in the remaining part of the drum for the spare cable. The capacity of the bare drum without the divider is 2,615 feet of ⅜-inch cable, 1,475 feet of ½-inch cable and 930 feet of ⅝-inch cable.

The Luther Hoist Attached to a Caterpillar Tractor

A Gear-Operated Bulldozer

A GEAR-OPERATED bulldozer, known as the Bully, which is useful for filling and leveling, for making shallow cuts where dirt is to be moved for a short distance, digging out and shoving rocks, stumps and other heavy obstructions, pushing stalled trucks or wagons, rough grading and spreading of gravel and other loose materials, as well as for use in mines or quarries or on dumps, is manufactured by Neiss & Co., Inc., 1613 Polk Street., N. E., Minneapolis, Minn.

The blade of the Model B, for attachment to the Cletrac 40 tractor, has a travel radius of 31 inches, the total clearance being 23 inches and the drop below the track shoes 8 inches. It also has a positive control at any position from the ground up, with automatic throw-out when the limit or lift is reached. Pressure can be applied and the blade held to the ground when cutting in hard surface or leveling. Electric welding throughout does away with rivets and bolts that are apt to work loose and shear.

The thickness of the bottom of the blade is double that of the upper section, a second sheet being welded on where the greatest strain occurs. In addition, the edges at the sides, top and bottom are reinforced with steel angles. The center of the blade is braced with heavy steel angles running vertically from the bottom upward to where the blade starts to curve. At the bottom of this curve and extending across the full width is a

The Bully Bulldozer Operated by a Cletrac Tractor

flat steel section set edgewise. Three pieces of the same dimension, also set on edge, furnish the vertical bracing to the top of the curve. The blade is further supported at the bottom with a frame composed of flat steel and H sections. Near the front end of the push beams and extending between them is a heavy H-beam, and welded to this and extending forward against the bottom of the blade are three flat sections set edgewise. These, in turn, are braced against each other with flat sections set between in a diagonal position.

The top of the blade below the curve is supported by four heavy steel braces, the two at each end resting on the push beams, while those between are fastened to the cross beam. The blade is set close to the tractor for easy steering.

The push beams are fastened at the center of the track frame and pivot at that point, the push also being from here. Also, the rise and fall of the tractor when traveling on even ground has the least effect on the position of the blade and, owing to the short length, there is no danger of bending or twisting.

Rub plates are provided at the front sprocket wheels of the tractor with rub irons fastened to the push beams. Buffer plates are fastened to the sides of the radiator support, and center the blade by bearing on angles attached to the front cross beam supporting the bottom of the blade. Very close adjustment is therefore possible without damage to the tractor parts. Removable sliding shoes are fastened to the under side of the push beam near the front to prevent digging and to carry the blade over soft ground.

Power for operating the blade is taken directly from the

CONWEIGH PICKUP CONVEYOR

Backs into material to be loaded by power
Turns around in its own length
8-hp. gasoline engine or 7½-hp. electric motor
18-inch belt conveyor
Manganese chain, sprockets and bucket teeth

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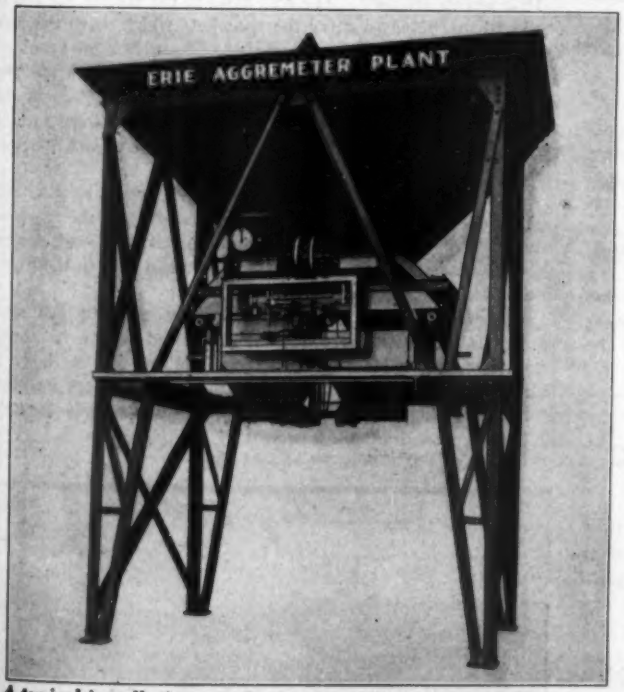

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All other operating members are directly in front of and in full view of one operator. Approved by Highway Departments everywhere.

Let Erie Buckets keep your bins full. Some of our customers have ten buckets in use in all kinds of digging. There is a reason. Write for prices by stating size interested in.

ERIE STEEL CONSTRUCTION COMPANY
BOX 8, SOUTH ERIE STATION
ERIE, PENNA.

transmission of the tractor through a pinion attached to the transmission shaft and driving a bevel gear. This gear has a large hub extending through the side of the case in which the entire gear assembly is housed. A clutch is mounted on the gear hub with a shaft set into the clutch and extending through the opposite side of the gear case, with a brake mounted on the other end of the shaft. At the center of this shaft are spur teeth cut from the same piece to form a gear. These teeth mesh with the gear segment mounted on the lifting shaft which extends through both sides of the gear case over the center of the tracks. At each end is fastened a bell crank to which are attached the lifting arms. Clutch and brake are mounted outside the gear case to permit of quick adjustment.

A New Type of Portable Chlorinator

A PORTABLE chlorinator housed in a tough fiber case constructed similar to a piece of hand luggage, has been announced by the Paradon Manufacturing Co., Arlington, N. J. When closed this chlorinator looks like a piece of baggage and would readily pass as such. The equipment consists of a standard dry feed Paradon chlorinator fully equipped. The unit is adaptable to continuous regular chlorinating service, as well as occasional emergency use.

The New Fiber-Cased Chlorinating Unit

A silver chlorine shut off valve is provided, making it possible to keep the apparatus under chlorine pressure when not in use, thus preventing access of moisture and other foreign material and allowing long periods of disuse without attendant deterioration of the unit.

No water supply is necessary for the operation of the unit. The apparatus can be supplied in any range of capacities from one pound of chlorine per 24 hours to 300 pounds. A chlorine testing outfit, spare parts, connection to main and all other necessary accessories are contained in the carrying case of the apparatus. A similar fiber container is provided for two 12-pound cylinders of chlorine.

An Automatic Hydraulic Tractor Scraper

AN hydraulic scraper built in sizes ranging from 1 to 5 yards capacity weighing from 1,000 to 2,750 pounds for operation with a tractor, but not requiring a pressure pump mounted on the tractor, thus eliminating connections or unions, has been developed by the Slate Construction Co., Albany, Oregon.

The Slate scraper is built sturdily and is equipped with a manganese cutting blade so that it can move earth that contains a large amount of rock. The machine will dig very hard material without the use of a plow or rooter and can also place the material in fill in even layers. The scrapers are hot riveted and arc-welded between rivets. The manganese cutting blade and skid shoes are bolted on and can be replaced without taking out any of the rivets. The hitch is a heavy cast steel clevise

The New Slate Automatic Scraper with Tractor Hitch

which has a full swing and will turn completely over, permitting short turning without cramping. The hitch also permits backing the scraper even when heavily loaded.

The scraper is operated entirely by the man driving the tractor. The accompanying illustration shows the scraper just going over to dump its load.

A Tractor Mounted Power Dump Body

THE Winsor power dump body, for use in excavating and grading work, is manufactured by the Winsor Co., Bucyrus, Ohio. This Winsor dump is mounted on a 10-20 Industrial McCormick-Deering tractor and has a capacity of 4 yards. As the tractor is not designed for such a load, the machine is supplied with an auxiliary rear axle which carries not only the pay load but the tractor itself, thus eliminating all load and twisting strain from the tractor which is used only as a power plant.

Disc wheels are used. The rear axles of the tractor are shortened and machined to carry the sprockets which drive the rear wheels by means of steel roller chains. The wheels are mounted on heavy Timken roller bearings. The front axle keeps the wheels in an upright position regardless of the position of the axle. In order that the machine will have a shorter turning radius a special steel axle hanger is used together with a longer front axle.

All parts in connection with the steering gear are steel and cast steel. The steering gear is so located that the machine can be driven in either direction and the driver's seat swivels about the steering post so that the driver can face in the direction in which he is traveling.

This Model 24 has an automatic body of 3/16-inch steel plate. It is electric welded and supported by heavy angles and channels welded to the body. The top of the body is flanged and turned, having 2-inch formed oak fillers inserted. It has an automatic body lock which holds the body securely at loading and dumping positions.

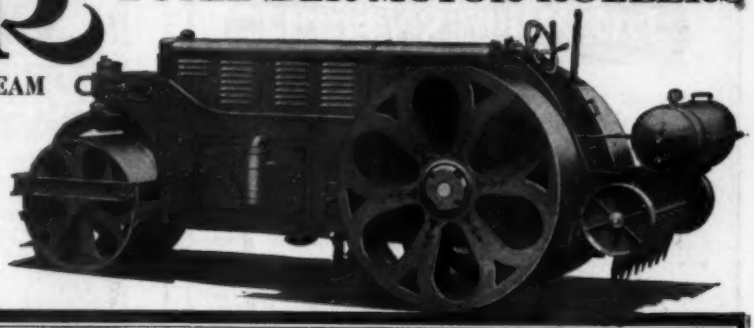
A C H & E No. 11 Triplex Pump Supplying Water to a Koehring 27-E Paver-Mixer on a Job at Waldo, Wis.

HUBER 4 CYLINDER MOTOR ROLLERS

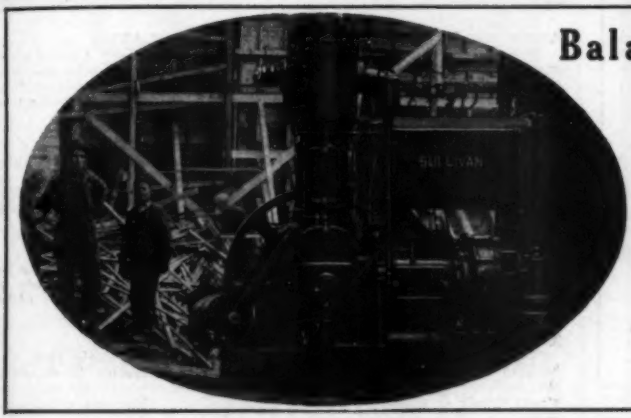
POWERFUL AND DEPENDABLE AS STEAM
EASY TO HANDLE
SINGLE LEVER CONTROL

MADE IN FOUR SIZES
5-7-10-12
tons

SEND FOR
HUBER ROLLER CATALOG



330 E. CENTER ST. THE HUBER MANUFACTURING CO. MARION, OHIO



Balanced Angle Compressor reduces equipment investment

A way to increase profits on large building, or water, or sewer jobs, was illustrated recently by a live building contractor.

Instead of backing up the riveting guns with several portable compressors—he used one Balanced Angle Compressor, mounted on two 10x10 timbers.

Obviously, the compressor investment was less. And the low cost air power of Balanced Angle Compressors was secured, without sacrificing portability.

Angle Compound Catalog 83-J

SULLIVAN MACHINERY COMPANY
814 WRIGLEY BUILDING, CHICAGO

PUNCHES, DIES AND RIVET SETS
CHIPPING CHISELS AND SPECIAL TOOLS
are shown in our new Catalog No. 9

THE CLEVELAND STEEL TOOL CO.
Punches. Dies. Chisels. Rivet Sets
660 E. 82nd St. Cleveland, O.

BURCH
UNLOADERS
CONVEYORS
SPREADERS
THE BURCH CORPORATION

Are built UP to a *STANDARD*
Not DOWN to a *PRICE*
Get our Catalog and learn more about them
Crestline; Ohio

THE MILBURN LIGHT

DESIGNED TO USE

CARBIDE OR CARBIC CAKE

That's Why It's Called

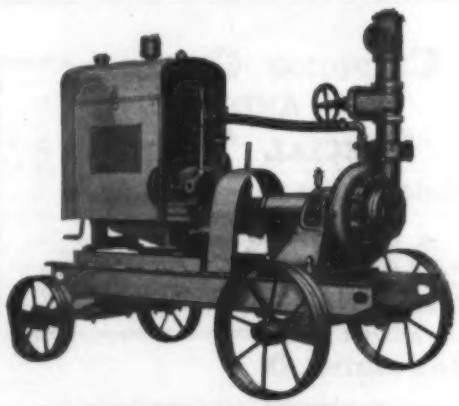
TWO-IN-ONE NO. 21

A New Simplified Light Resulting from 22 Years of Successful Light Building

Comprehensive information on the Two-in-One Light is contained in circular No. 270. Write for a copy.

THE ALEXANDER MILBURN CO.

1416-1428 W. BALTIMORE STREET
BALTIMORE, MD.



C H & E

SEWAGE AND TRASH PUMPS

Impeller will pass anything entering the suction nozzle: sewage, roots, weeds, stones, sod, wood-trash.
No foot valve needed.
Simple, quick, effective priming with C. H. & E. Priming Device.
Capacity per minute: from 800 gallons No. 4 Pump to 2,500 gallons No. 8 Pump.

Write for Bulletin

MANUFACTURED BY

C. H. & E. MANUFACTURING CO., INC.

250 Mineral Street Milwaukee, Wis.

CONTRACTORS WILL FIND THESE CATALOGS USEFUL

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

AN 8-FOOT GRADER WITH TELESCOPIC REAR AXLE
Bulletin 1077 describing the new 8-foot Austin Giant leaning-wheel grader, among the features of which are the telescopic axle, steerable offset engine hitch, blade lifting mechanism and blade side shifting mechanism, may be secured by those interested from Austin-Western Road Machinery Co., 400 North Michigan Avenue, Chicago, Ill.

A NEW DRILLING MACHINE
Bulletin MT describing the Loomis clipper, a well drilling machine made in 8 sizes with capacities ranging from 800 to 1,200 feet, for use in drilling wells, blasting holes, stripping, building and bridge foundation tests and similar work, may be secured from the Loomis Machine Co., Tiffin, Ohio.

SCRAPERS WITH AUXILIARY BACK-UP CONTROL
Literature describing Schaefer automatic tractor scrapers among the features of which is the automatic auxiliary back-up control may be secured from the Gustav Schaefer Co., 4180 Lorain Avenue, Cleveland, Ohio.

MORE LIGHT AT LESS COST
National Carbide Sales Corp., 342 Madison Avenue, New York, will be glad to send to those interested complete information in regard to the National Carbide lanterns for use by contractors, tunnel workmen, street repair crews and others wanting a strong, clear and penetrating light.

NEW TRACTOR-MOUNTED HYDRAULIC BULLDOZERS
Bulletin No. 273, describing the new Baker hydraulic bulldozers mounted on Caterpillar Twenty or Thirty tractors which can operate at various distances below the level of the tractor track, keep a nearly level grade and are easily operated, may be secured from the Baker Manufacturing Co., 585 Stanford Avenue, Springfield, Ill.

A NEW STABLE ARC WELDER
Information concerning the new Lincoln stable arc welder mounted on a McCormick-Deering tractor which is furnished in either a 200 or 300-ampere machine and offers a wide range of utility may be secured from the Pontiac Tractor Co., Pontiac, Mich.

A LIGHT ALL-PURPOSE DRILL
Gardner-Denver Co., Denver, Colo., will be glad to send to those interested a complete description of the Gardner-Denver new all-purpose rock drill which weighs only 50 pounds and may be mounted for light drilling, channelling with a quarry bar, used on a tripod or for miscellaneous work where a light mounted drill is desired.

A PORTABLE STONE CRUSHING UNIT
A complete description of the new Day portable stone crushing unit which has a capacity of from 6 to 10 tons per hour with the jaws set for materials 2½-inch and under, has an overall height of 46½ inches, a weight when mounted of 7,600 pounds and is powered by a tractor, will be sent to those interested by the Day Pulverizer Co., Knoxville, Tenn.

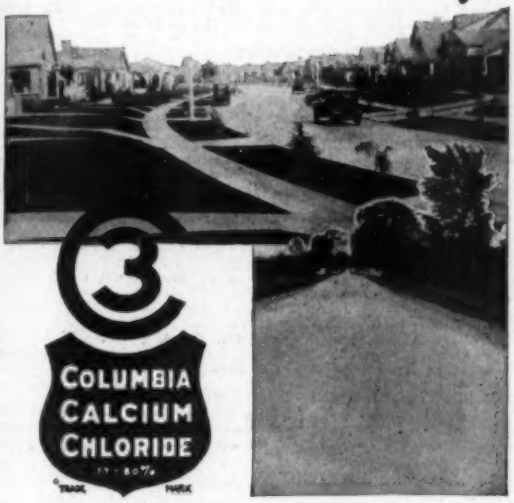
A NEW MATERIAL LOADER
Chicago Automatic Conveyor Co., 1853 South 55th Avenue, Chicago, Ill., will be glad to send to those interested a complete description of the Model BU material loader which is designed for use in unloading sand, gravel or crushed stone from cars without the necessity of a pit.

A NEW LOADING SKIP FOR MIXERS
Complete information in regard to the new loading skip for Lakewood 21 and 28-S mixers, which is so constructed that standard batch delivery trucks with pneumatic tires can be backed into it and deliver the batches without the need of bins or batchers at the plant, may be secured from Lakewood Engineering Co., Cleveland, Ohio.

A COMPLETE PROPORTIONING AND MIXING UNIT
Bulletin No. 329 describing the new Smith Weigh-Mix, a unit which weighs all aggregates and then mixes and which saves 6 to 10 feet in head room, may be secured from T. L. Smith Co., 1125-32nd Street, Milwaukee, Wis.

CONCRETE FACTS
This is the title of a booklet describing Transit System mixed concrete and Paris Transit mixers which consist of a revolving mixing drum, constructed to be mounted on a truck, and deriving the power for rotating and tilting the drum from the truck. Copies of this booklet may be secured from Transit Mixers, Inc. (R. Boyd, Adv. Mgr.), Call Bldg., San Francisco, Calif.

City Street or Country Highway!



CONCRETE PAVEMENTS COMPLETED IN LESS TIME AT LOWER COST!

IT is generally considered safe to open new concrete pavement to traffic when the slab attains a flexural strength of 500 pounds per square inch.

Concrete cured with "3-C" CALCIUM CHLORIDE attains this strength in 5 to 7 days—approximately 14 days quicker than by other methods. Labor costs greatly reduced. No earth or straw covering. Special pumps, pipe lines and sprinkling all eliminated.

Economy and efficiency recommend Calcium Chloride curing.

TECHNICAL SERVICE

Write for literature fully describing the advantages of Calcium Chloride curing.

We also offer the services of our technical staff in helping you with your curing problems.

"3-C" 77%-80% Calcium Chloride is manufactured by the Columbia Chemical Div., Pittsburgh Plate Glass Company under Patents No. 1,592,971 and 1,527,121

THE COLUMBIA PRODUCTS CO.
BARBERTON OHIO

THE RIGHT TOOL SAVES TIME

. . For Grading

Here is the finest time and labor saving tool ever designed for light ditching, leveling up the roadbed or other excavations, trimming and grading shoulders. One man with this tool does nearly as much as two men with pick and shovel.

Workmen like the True Temper Grading Hoe because it is perfectly hung, swings easier than a pick, and does more work with less effort.

Blade and eye forged from one piece of high carbon steel, oil tempered. Three and one-half foot selected hickory handle, oval shaped to fit the hand. Blade is 7 inches wide and 7¼ inches deep.

The brand True Temper is burned in the handle to mark each hoe as the best tool of its kind that can be made.

THE AMERICAN FORK & HOE COMPANY
1937 Keith Building
Cleveland, Ohio

Makers of Farm and Garden Tools for over 100 years.

Branded on the handle of every genuine TRUE TEMPER *tool*

If your dealer has not yet stocked the Grading Hoe, Cat. No. IGH7, send us his name and $2.10 and we will supply you direct; postpaid.

FREE *on request*
Heavy Steel Goods or Industrial Tool Catalog. Describes over 50 tools for mill, mine, factory and coal yard.

TRUE TEMPER TOOLS

TURBINE AIR CONCRETE SURFACES

Turbine Air Concrete Surfacer being used on this bridge job

The ideal Surfacer for removing fins and board marks, for rubbing out irregularities on concrete walls and buildings, and for exposing the aggregate of artificial concrete block.

Write for our catalog

THE TOUSLEY TOOL CO.
1965 East 66th Street, N. E. Cleveland, Ohio

VULCAN SHR VALVES
Reduce Operating Costs

Better Service
Fewer Regrinds
Less Replacements
On all Gas Equipment using these valves.

VULCAN
SHR
VALVE

Take advantage of superior performance. Install these valves when repairing your equipment.

Representatives wanted in territory still open.

Write or Wire

INDUSTRIAL ENGINE PARTS, INC.
1053 East Sixty-first Street
Cleveland, Ohio

Contractors—Use This Service

A NEW CRAWLER TRACTOR
United Tractor & Equipment Co., Dept. No. AC-1, 612 North Michigan Ave., Chicago, Ill., will be glad to send full details of the new United crawler tractor which has a speed range of from 2.3 to 9.5 miles per hour and is light and speedy enough for small jobs yet equipped with double duty power for the large ones.

SOLUTION FEED CHLORINATORS
Solution feed chlorinators which make use of the vacuum principle of control and which insure safe drinking water or sterilized water for industrial uses are described in literature which may be secured from Wallace & Tiernan Co., Inc., Newark, N. J.

HOISTS AND DERRICKS
A complete line of hoists and derricks for the operation and handling of building equipment and materials are described in literature which Clyde Iron Works Sales Co., Duluth, Minn., will be glad to send on request.

A NEW AND MODERN MAGNETO
Eisemann Magneto Corp., 165 Broadway, New York, will be glad to send to those interested complete information in regard to the new completely enclosed yet adequately ventilated Model GV-4 Eisemann magneto.

POWER DRAG SCRAPERS
L. P. Green, 564 Monadnock Bldg., Chicago, Ill., will be glad to send to those interested a catalog describing power drag scrapers as well as other types of gravel and excavating equipment.

MACHINERY TRAILERS FOR MOVING EQUIPMENT
Complete information in regard to Highway machinery trailers which travel at motor truck speed and save time in loading, unloading and moving heavy machines may be secured from the Highway Trailer Co., Edgerton, Wis.

SEVEN SIZES OF REVOLVING SCRAPERS
Killefer Manufacturing Co., 5525 Downey Road, Los Angeles, Calif., will be glad to send to those interested a folder describing all models of Killefer revolving scrapers which are made in sizes of from 4 to 8 feet in width with capacities from 18 to 81 cubic feet, dirt measure.

OPEN DISCHARGE PUMPS
A booklet describing the Humdinger open discharge pump for suction lifts up to 25 feet as well as the diaphragm force pump for total heads up to 50 feet will be to those interested by the Ralph B. Carter Co., Hackensack, N. J.

COMPRESSORS FOR CONTRACTORS' USE
The Buhl Co., Old Colony Bldg., Chicago, Ill., will be glad to send to those interested descriptive bulletins containing complete information in regard to its line of portable compressors for use by contractors.

A NEW AND IMPROVED SAFETY HOOK
Public Works Equipment Co., Inc., 1776 Broadway, New York, will be glad to send to those interested complete information in regard to the new and improved Anderson safety hook for hoisting equipment which is made with reinforced flaring lips at the bottom of the hook which form an interlocking link and thus prevent the hook becoming unfastened when attached to the load.

DRILLS AND DRILL TOOLS
A catalog describing the complete line of drills and drill tools for every kind of big blast hole drilling may be secured by those interested from the Sanderson Cyclone Drill Co., Orrville, Ohio.

HEAVY DUTY MIXERS AND PAVERS
Complete information in regard to Koehring heavy duty mixers and pavers which are so constructed as to give greater reliability, lower maintenance and longer service life, may be secured by those interested from Koehring Co., Milwaukee, Wis.

TWO NEW CONSTRUCTION HOISTS
The New Novo WH two-drum and three-drum hoists which have electric welded bases, nickel alloy side frames and gears, shrouded ratchets, double fly-wheel engines and finger tip control are described in the folder "Up She Goes," which the Novo Engine Co., 216 Porter Street, Lansing, Mich., will send on request.

EXPANSION JOINTS FOR CONCRETE ROADS
The Carey Elastite expansion joint for concrete roads which safeguards the road from expansion and contraction is described in literature which may be secured from the Philip Carey Co., Lockland, Cincinnati, Ohio.

CUTTING DIRT MOVING COSTS
Catalog No. 10 describes dirt moving with the Sauerman one-man operated power scraper which has capacities of from 100 to 400 cubic yards per hour and may be secured from Sauerman Bros., Inc., 464 South Clinton St., Chicago, Ill.

A DRAGLINE FOR RIVER WORK
Class 230 Bucyrus-Erie dragline for use in river work which has a 6-yard bucket, 150-foot boom and a digging reach of 170-180 feet, is described in literature which the Bucyrus-Erie Co., South Milwaukee, Wis., will be glad to send on request.

A SLIDING RULE FOR CONTRACTORS AND ENGINEERS
A description of the new Interlox Master sliding rule which is marked on one side like an ordinary rule, is marked on the other for direct reading, is sliding so that it can be extended to fit an opening and then locked with the automatic locking device and the reading taken, may be secured from the Master Rule Mfg. Co., 815 East 136th Street, New York.

See the Whirlpool

The pump's sucking air. Can it lose its prime? It can not. It's a Self Priming Homelite Portable centrifugal pump. Has it a foot valve? It has not. Has it any auxiliary vacuum contraptions? It has not. 6000 gal. per hr. or a dribble. Weighs less than 100 lbs.—complete with air-cooled gasoline engine.

Write for name of nearby distributor who will demonstrate on your job.

See exhibit at Atlantic City Road Show, Jan. 11th to 17th inclusive

HOMELITE CORPORATION
71 Riverdale Avenue, Port Chester, N. Y.

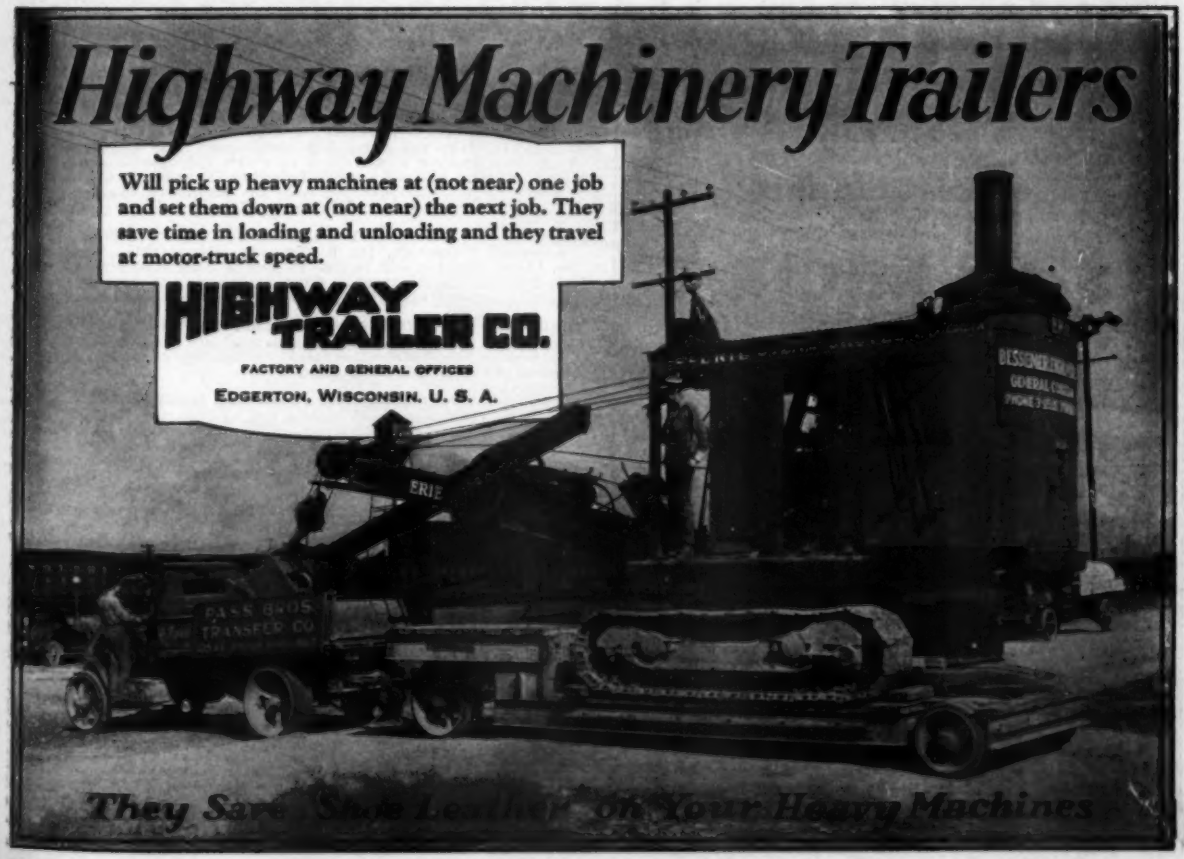
3751

Homelite Self Priming Portable Centrifugal Pump

Highway Machinery Trailers

Will pick up heavy machines at (not near) one job and set them down at (not near) the next job. They save time in loading and unloading and they travel at motor-truck speed.

HIGHWAY TRAILER CO.
FACTORY AND GENERAL OFFICES
EDGERTON, WISCONSIN, U. S. A.



They Save Shoe Leather on Your Heavy Machines

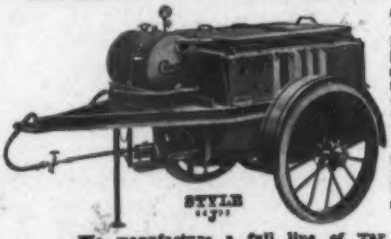
THE SANDERSON CYCLONE DRILL CO., ORRVILLE, OHIO

DRILLS

and drill tools for every kind of Big Blast Hole Drilling

Catalog Mailed on Request

SPEED UP WORK BY USING



STYLE "J"

a Connery Style "J" oil-burning kettle. Here's a kettle that answers all requirements:—low fuel cost, quick heating, roller-bearing wheels and springs, absolute temperature control and solid rubber tires if desired.

We manufacture a full line of Tar and Asphalt Kettles, Oil Burning Kettles, Oil Burners, Torches, Pouring Pots, Hand Spraying Attachments, etc. Send for "Blue Book" describing our equipment.

Connery & Company, Inc.

4000 N. Second Street, Philadelphia, Pa.

Dependable Power

in sizes ranging in HP. from 3 to 180

Le Roi Company

Milwaukee

LE ROI ENGINES

for dependable power!

Hayward Buckets

Let Hayward Engineers recommend a bucket to fit the job. The Hayward line includes Clam Shell, Orange Peel, Drag Line and Electric Motor Buckets; Dredging, Excavating and Coal Handling Machinery; Automatic Take-up Reels; Counterweight Drums.

THE HAYWARD COMPANY

32-36 Dey Street New York, N. Y.

Contractors—Use This Service

A NEW EXCAVATOR

Bulletin No. 629 describing the new Haiss excavator, which digs and loads continuously, makes a cut 8 feet wide in a single pass, digs from a skimming cut to one 4 feet deep, works in close quarters and requires only 13 feet headroom with the conveyor discharge, may be secured by those interested from George Haiss Manufacturing Co. (A. W. Haiss, Pres.), 142nd Street and Park Avenue, New York City.

AN ELEVATING GRADER WITH POWER TAKE-OFF

A complete description of the new Russell elevating grader, known as the Russell Sixty, which is built for power take-off only and has a greater capacity than any previous models of the same line, may be secured from the Road Machinery Division of the Caterpillar Tractor Co. (W. H. Gardner, Adv. Mgr.), San Leandro, Calif.

A COMPLETE LINE OF DRILLS

A 42-page bulletin giving complete details of the various sizes and types of Calyx drills for use in all kinds of drilling as well as giving much general information on the subject of core drilling may be secured by those interested from Ingersoll-Rand Co. (G. W. Morrison, Pub. Mgr.), 11 Broadway, New York.

STEEL CONCRETE SPADERS

Steel concrete spaders, known as True Temper tampers, the shank and handle of which are offset from the plane of the blade so that it can be pushed down flush with the side of the form, insuring a smooth surface of concrete, are described in Catalog HG-1, which the American Fork & Hoe Co. (S. S. Chapin, Secy.), Keith Bldg., Cleveland, Ohio, will be glad to send to any one interested.

A NEW PORTABLE ACETYLENE GENERATOR

A complete description of the new Milburn portable acetylene generator, for welding and cutting, which is made of drawn seamless steel throughout in three sizes of 35, 70 and 100-pound capacity will be sent on request by the Alexander Milburn Co. (A. F. Jenkins, Pres.), 1416-1428 West Baltimore Street, Baltimore, Md.

COMPLETE INFORMATION ON CHAINS AND CONVEYORS

The Rex 330 Catalog and Engineering Data Book, an 800-page volume containing information on chains and chain drives, elevators and conveyors, traveling water screens and construction machinery, a complete description of the various types of equipment and the merits of each type for the handling of various kinds of materials, as well as a large amount of valuable engineering data of a nature that will help in the selection, operation and maintenance of systems for the mechanical handling of materials, may be secured from the Chain Belt Co. (R. A. Shilbauer, Adv. Mgr.), 767 Park Street, Milwaukee, Wis.

LOCOMOTIVES WITH INTERNAL COMBUSTION ENGINE DRIVE

This is the title of a booklet, describing Whitcomb locomotives with internal combustion engine drive, their features and use, which may be secured by those interested from the George D. Whitcomb Co. (Lawrence H. Cornelius, Adv. Mgr.), Rochelle, Ill.

A CONVERTIBLE SHOVEL, DRAGLINE OR TRENCH HOE

A 32-page booklet containing a complete description of the Moore Speedcrane, a convertible shovel, dragline, trenchoe, among the features of which are simplicity of design and construction, ease of operation, low center of gravity, automotive type foot accelerator, automatic boom hoist brake and swing lock, single unit main drive shaft and clutch, steel operator's cab, closed in winter and open in summer and electric starting with all controls in convenient reach of the operator, will be sent to those requesting it by the Manitowoc Engineering Co. (C. C. Miller, Sales Dept.), Manitowoc, Wis.

TRACTORS FOR ROAD AND GENERAL CONTRACT WORK

Cleveland Tractor Co. (H. E. Orr, Adv. Mgr.), 19321 Euclid Avenue, Cleveland, Ohio, will be glad to send to those interested literature describing the Cletrac tractors which are made in a range of sizes to meet the needs of every kind of road or general contract job.

MACHINES FOR SHOULDER OR BERM CONSTRUCTION

Literature describing Moritz Hi-Way machines for shoulder or berm construction and maintenance may be secured from the Highway Shoulder Machine Co., Effingham, Ill.

MOUNTING EQUIPMENT FOR PORTABLE MACHINERY

Catalogs describing the complete line of mounting equipment for portable machinery, including wheels, trucks, trailers, crawlers and parts, will be sent on request by the Electric Wheel Co. (G. A. Tipton, Adv. Mgr.), Dept. CM, Quincy, Ill.

QUICK SETTING CEMENT

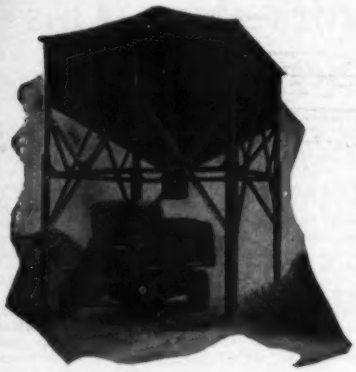
Literature describing the Incor brand perfected high-early-strength portland cement which sets and is ready for use in a few hours after pouring may be secured by those interested from the International Cement Corp. (Howard Rhode, Sales Mgr.), 342 Madison Avenue, New York.

WOODWORKING MACHINERY

Literature describing a complete line of wood working machinery including variety woodworkers, band saws, mortisers, planers, jointers, hoists, saw tables and portable saw mills may be secured by those interested from the American Saw Mill Machinery Co., 171 Main St., Hackettstown, N. J.

A CENTRIFUGAL PORTABLE PUMP

The new Evinrude centrifugal portable pump which can handle 15,240 gallons per hour at a 5-foot head, has a 6-horsepower 2-cylinder motor, and is 10 pounds lighter and 11 per cent more compact than its predecessor, is described in a catalog which may be secured from Evinrude Division, Outboard Motors Corp., 3901 27th Street, Milwaukee, Wis.



THE ONLY BINS BUILT ENTIRELY OF COPPER BEARING STEEL

To produce a bin of the best possible engineering design and enduring qualities, Beaumont Bins are built entirely of copper bearing steel plate. They are the only bins on the market with this feature.

9 big features

1. Constructed of copper bearing steel plates which insures the bin lasting two to three times as long as ordinary steel bins.
2. Structurally rigid, properly designed and all bolted construction.
3. Built in standard sizes to answer all possible requirements.
4. Easily portable.
5. Full gravity discharge, no clogging in the bins and at gates.
6. Speeds up material handling.
7. No projecting columns to prevent bins being placed side by side.
8. Ample truck clearance is provided.
9. Easy erection. Shipped in a few parts that are all match-marked and accurate as to hole spacing.

Write for Catalog 100

BEAUMONT MANUFACTURING CO.
330 Arch Street, PHILADELPHIA
2163-E Straus Bldg., CHICAGO

BEAUMONT COPPERSTEEL BINS

"DOMESTIC" AUTOMATIC PRIMING CENTRIFUGAL PUMPS

This Pump absolutely primes itself; and will draw water 27 feet vertical.

Is ideal for use on all types of dewatering jobs including Drainage Point Predrainage, etc.

The positive high vacuum this Pump is able to create has, in many cases enabled contractors to drain DRY, deep excavations where other suction type pumps have failed.

Literature upon request

Manufactured by

Automatic Control of vacuum producing action keeps the Pump primed whenever there is enough water to seal and fill the suction line. This is a valuable feature, as it not only gives large pumping possibilities but KEEPS the excavation DRY by taking care of seepage inflow.

In addition to these Automatic-Priming Centrifugal Pumps—the "DOMESTIC" Pump line includes the "Giant" self-oiling Triplex Road Pump, Diaphragm Pumps, Vertical Plunger Trench Pumps, Triplex and Sextuple Jetting Pumps, etc.

DOMESTIC ENGINE & PUMP CO., Shippensburg, Penna.

CEM10-29

Challenges Competition and Invites Comparison!

The WILLIAMS "Champion" Bucket is put on your work definitely guaranteed to outdig and outlast any other bucket.

Compare the new "Champion" with any other bucket—you'll find 21 distinct points of superiority—points which mean extra profits for you.

Write for our folder SP-25 giving full details.

WILLIAMS
FAST-DIGGING BUCKETS

G. H. WILLIAMS CO.
609 Haybarger Lane
Erie, Pa.
Branch Offices: New York, Pittsburgh, Chicago

"TEN TIMES MORE LIGHT"

"Ten times more light than an oil lantern, and at less cost"—

This remark by a railroad man explains why thousands of National Carbide Lanterns are being used today by contractors, miners, tunnel workmen, street repair crews, and others who want a dependable, strong, clear and penetrating light.

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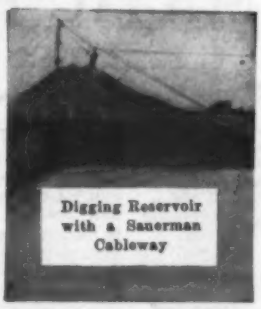
Long-Distance Digging Simplified

SAUERMAN Slackline Cableways can reduce your payroll—can cut overhead charges—can save you a lot of equipment expense—whenever you have an excavating job where the material has to be moved any distance from 200 to 1,000 feet or more. Write for new 56-page catalog and see for yourself how hundreds of excavating problems can be simplified.



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For Oil, Water, Brine, and Various Liquid & Dry Commodities.

Shipped K. D. in sections and bolted together with special gasket and cement, making tight and impervious joints.

In case of removal, easily disassembled and re-erected. Capacities to a million gallons and larger. Write for our folder, "Bolted Tanks in Industry."

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KANSAS CITY, MO. ESTABLISHED 1893

Contractors—Use This Service

BOOM SWINGER FOR STEEL ERECTION
Literature describing the Brown boom swinger with the exclusive bronze screw thrust and positive release control may be secured from the Brown Clutch Co., Sandusky, Ohio.

A ONE-MAN PULLING AND LIFTING TOOL
T. H. Edelblute Co., Oliver Bldg., Pittsburgh, Pa., will be pleased to send a copy of Bulletin 109, describing the Anchor Puller-jack which may be used by one man to handle jobs of pulling, moving, and lifting heavy loads, doing the work of chain hoists, lifting jacks, winches and block and tackle on many jobs.

AUTOMATIC METER FOR UNIFORM CONCRETE
A folder issued by the Automatic Meter Sales Co., 3115 Plankinton Bldg., Milwaukee, Wis., describes in detail the automatic meter which accurately and uniformly measures the amount of water used in each batch of concrete, and which is not affected by variation in pressure.

A CATALOG OF ROAD MAINTENANCE EQUIPMENT
The American Steel Works, 1211 West 27th St., Kansas City, Mo., has issued a new 14-page catalog, No. 120, in which it describes its complete line of road maintenance equipment which will be of interest to contractors.

AN AUTOMATIC TRACTOR SCRAPER
The Slate hydraulic scraper which can be set to dig at any angle and which is equipped with a special manganese steel cutting blade which will dig without the earth being previously plowed or scarified, is described in literature which may be secured on request from the Slate Construction Co., Albany, Ore.

ROAD BUILDING MACHINERY
W. A. Riddell Co., Bucyrus, Ohio, has recently issued a new catalog, No. 2901, in which it describes Warco road building machinery including power graders, snow plows, scoops, crawlers and rollers. Copies of this well-illustrated 32-page catalog will be sent to interested contractors on request.

HIGH EARLY STRENGTH CONCRETE
An interesting 16-page booklet has been issued by the Universal Portland Cement Co., 210 South La Salle St., Chicago, Ill., describing the use of Universal cement to obtain high early strength concrete for various road, street and bridge projects.

AN IMPROVED PAVEMENT TESTER
Bulletin No. 85-C describing the improved Sullivan pavement tester which provides a core giving an exact sample of any type of road surfacing, may be secured from the Sullivan Machinery Co., 400 North Michigan Avenue, Chicago, Ill.

NEW PORTABLE CENTRIFUGAL PUMP
The literature of the American Steam Pump Co., Battle Creek, Mich., describes in detail the new American-Marsh Redi-Prime portable centrifugal pump for pumping from excavations, conduit tunnels or manholes, or supplying water for road building and general construction, the pump operating from any position.

PORTABLE LIGHT AND POWER PLANTS
A complete line of portable, light-weight light and power plants for use in supplying electricity or power for floodlights, tools, compressors, electric motors or for the illumination of construction plants, is described in literature which may be secured from the Modern Equipment Co., McIlwraith St., Muskegon Heights, Muskegon, Mich.

A HOIST FOR USE WITH TRACTORS
Complete information in regard to a new hoist designed for use with the Caterpillar Twenty, a feature of which is that it is so guarded as to reduce to a minimum the danger of injury to the operator, may be secured from the Luther Manufacturing Co., Olean, N. Y.

FULL REVOLVING CRAWLER TYPE SHOVEL
Ohio Locomotive Crane Co., Bucyrus, Ohio, will be glad to send to those interested complete information in regard to the new Model TS full-revolving crawler-type machine which may be used as a shovel, crane, dragline or trench hoe.

A CONCRETE TIE AND SPACER WITH DETACHABLE HEAD
A complete description of the new Red-Head concrete tie and spacer with a detachable head for use with panel type construction may be secured by those interested, from the American Form-Hold Corp., 801 Universal Bldg., Los Angeles, Calif.

A NEW TRACTOR POWER WINCH AND BULLDOZER
A new tractor power winch and bulldozer for the Model Twenty Caterpillar tractor which attaches direct to the tractor housing in a one-piece casting, is described in literature which the Miami Trailer Scraper Co., Troy, Ohio, will be glad to send on request.

A GEAR-OPERATED BULLDOZER
Neiss & Co., Inc., 1013 Polk St., N.E., Minneapolis, Minn., will be glad to send on request a complete description of the Bully bulldozer for use with Cletrac tractors, the blade of which has a travel radius of 31 inches, a total clearance of 23 inches and the drop below the track shoes 8 inches.

CAST IRON PIPE
Complete facts and figures about deLavaud cast iron pipe which resists an internal pressure of more than 3,000 pounds per square inch may be secured from the United States Pipe & Foundry Co., Burlington, N. J.

JACKS FOR CONSTRUCTION USE
Simplex lever jacks, pipe pushers, trench braces, and screw jacks for use in construction work are described in literature which may be obtained from Templeton, Kenly & Co., Chicago, Ill.

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Many a contractor has lost money on a job due to bad weather—equipment tied up and men idle.

Euclid Wagons are designed to overcome delays in construction caused by bad weather conditions. Over soft ground or through mud they ride with a very light draft.

This is only one of many advantages offered the contractor in Euclid Wagons. There are many more but they all result in lower operating costs—lower haulage costs—finally greater profit on your investment.

Better get thoroughly acquainted with this modern wagon. Write for bulletins.

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Specifications 8-yard wagon

Width body inside at top	6′ 0″
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Height body	6′ 0″
Height of low side, extension removed for elevating grader	5′ 1″
Shovel loading capacity 7 or 8, 1¼-yd. dippers	

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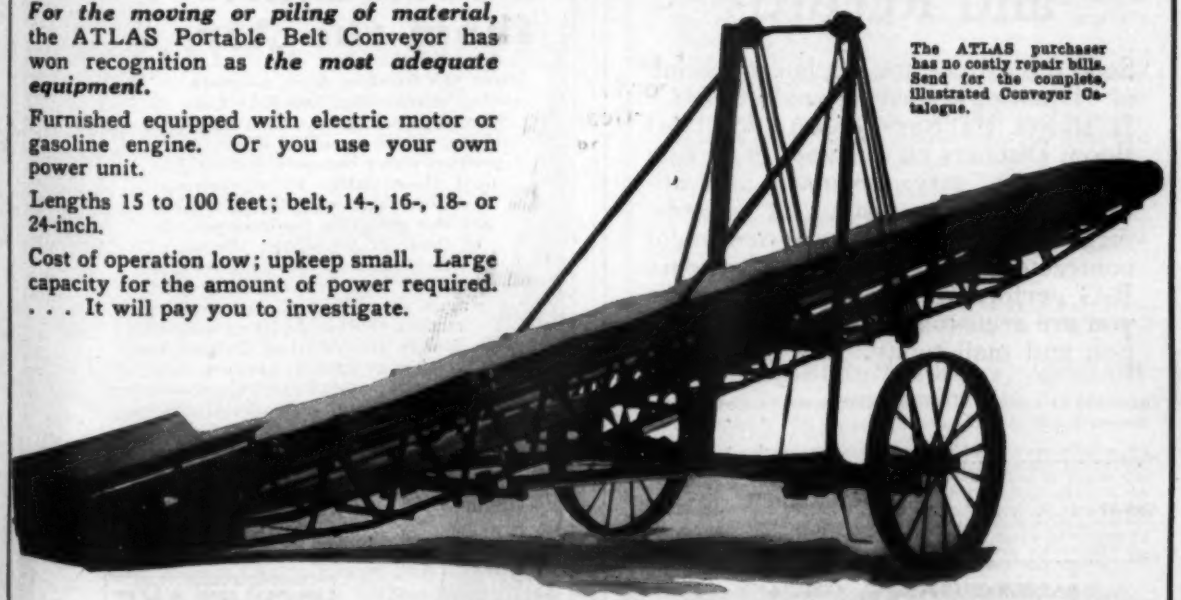
For the moving or piling of material, the ATLAS Portable Belt Conveyor has won recognition as ***the most adequate equipment.***

Furnished equipped with electric motor or gasoline engine. Or you use your own power unit.

Lengths 15 to 100 feet; belt, 14-, 16-, 18- or 24-inch.

Cost of operation low; upkeep small. Large capacity for the amount of power required. . . . It will pay you to investigate.

The ATLAS purchaser has no costly repair bills. Send for the complete, illustrated Conveyor Catalogue.



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Box "N" *Manufacturers of Bucket Elevators—Loaders—Tractors, Etc.* Branch Office

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Built to Stand the Gaff

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"GROUNDHOG"

REVOLVING TRACTOR SCRAPER

A stout, two-fisted, hard-hitting outfit that does the work where others fail. Saves time, effort and money. Loads and spreads or dumps continuously under forward draft—no stopping—no time lost. Depth of cut under instant control. Adjustable to all conditions.

Write for Information

THE RODERICK LEAN COMPANY

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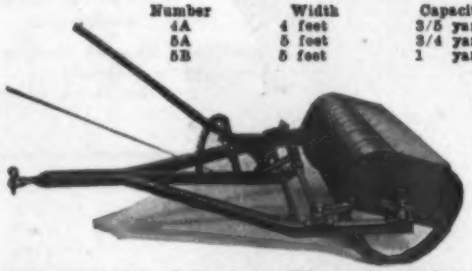
Number	Width	Capacity
4A	4 feet	3/5 yard
5A	5 feet	3/4 yard
5B	5 feet	1 yard



A long lever regulates depth of cut. Bites as deep as desired and stops loading instantly. No stalling, no over-loading. A simple and positive control for loading, dumping and spreading.

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Toledo Torches have established a reputation . . . for dependable performance at low cost, that is unequalled by any other safety light made.

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Learn the freedom from concrete curing worries that Dowflake Calcium Chloride gives. This flaky, white, easily handled chemical product cures concrete uniformly and thoroughly by absorbing moisture from the air and retaining this moisture for long periods of time. It accelerates the set of concrete and gives it a higher than normal early strength. Properly used, it reduces the tendency to surface voids and pitting and minimizes the freezing danger. Used either as a surface curing agent or in the mix, it has many advantages from the standpoint of efficiency and economy. Write for our free book "How to Cure Concrete" and other information.

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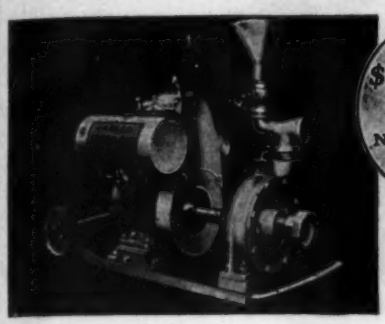

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Jaeger builds all types—sizes

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"Standard of the World"

Steam, Gas and Electric Hoists, Dredge Hoists, Belt Hoists, Ship, Cargo and Dock Winches, Capstans, Cableways

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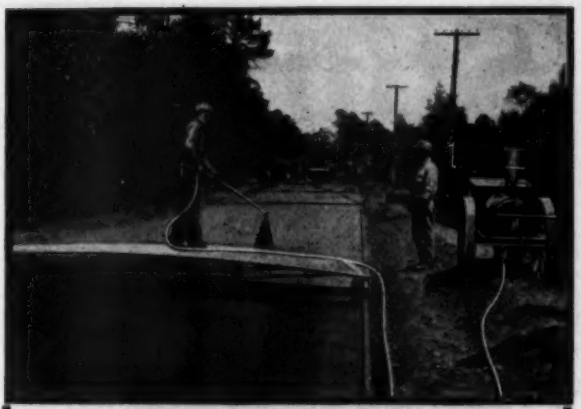

Curcrete being sprayed on North Carolina State Highway, Route No. 21, just outside of Lillington, North Carolina.

This method of curing concrete is easy and perfect!

The Curcrete method eliminates the uncertainty which attends the use of water, burlap, hay, earth, chemical and other curing materials. The sufficiency and thoroughness of the application are visible to both the contractor and the inspector, and no further attention is necessary after Curcrete is applied.

Curcrete is a bituminous emulsion manufactured specifically for curing concrete, and is already in extensive use. It is applied in the form of a fine spray to freshly finished concrete while it is still soft and wet. Its use stops evaporation of water from the concrete immediately, thus preventing surface checking and subsequent scaling, and at the same time insuring maximum and uniform strength.

With all its advantages, the Curcrete method costs no more than any other process of curing. One gallon of Curcrete covers 8 to 10 square yards, and 150 to 200 square yards per hour can be cured by our specially-designed pressure sprayer, operated by one man.

Write us today for the interesting Curcrete booklet which tells all about the Curcrete method and gives the results of tests.

Visit our booth at the 1930 Road Show to be held in the Convention Hall, Atlantic City, N. J., Jan. 11-17, 1930, inclusive.

THE BARBER ASPHALT COMPANY

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"Curcrete" (trade-mark registered) is sold for use in the curing of concrete by the "Curcrete" method (U. S. patents 1,539,763 and 1,684,671, and foreign patents pending) controlled by The Barber Asphalt Company. The Barber Asphalt Company grants to the purchasers of "Curcrete" the right and license to practice the "Curcrete" method of curing concrete, controlled by it, in connection with the use of "Curcrete" produced by it, and the purchasers by accepting "Curcrete" accept the license and acknowledge the company's rights in connection with the "Curcrete" method.

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What load do you have to lift?
What line speed do you desire?

—Tell us, and we will specify the type and size of hoist best fitted to your job. There's an O. K. HOIST for every hoisting need—single-, double- or triple-drum, 8-150-horse-power, gasoline or electric power.

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Bucket Elevator Conveying and Screening Material Into Hopper

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BELT DRESSING

Leather, rubber, and fabric belts all grip better when treated with Dixon's Belt Dressing—and, this aid to longer belt life and better operation "goes on" without the slightest danger of "clogging" or harming the finest belt.

Its handy stick form permits belt dressing without the stopping of machinery. To use it, simply tear off part of the paper around the stick, grip firmly in the hand and hold it on to the moving belt. No loss of time—no dirt—no slipping belts—and in addition Dixon's "food for belts" will keep your belts in perfect condition.

If your belts are exposed to steam, spattering water, chemicals, or heavy dust condition, order—

DIXON'S TRACTION BELT DRESSING

a special paste dressing made specially for this type of service.

Circular 148-0 will give you full information on each of these products.

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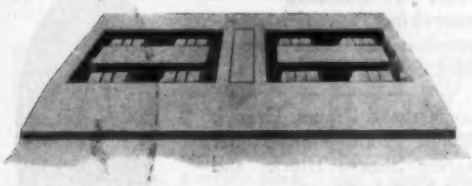
The rocking motion of these axles distributes the load equally over all tires, resulting in safety of the load, minimum wear on pavements and maximum usefulness of tires.

This feature, plus the Rogers Gooseneck and distinctive method of building the frame, permits the building of multi-wheel units of 45, 60, 75 or even 100 tons capacity. Write for literature.



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—and that it is extremely economical to operate because of its simple design and few wearing parts.

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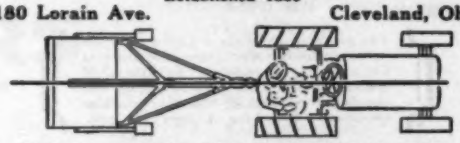

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Specializing in Boilers for Contractors' Equipment

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October

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Oil Reservoir Sheaves for Long Life, High Speed and Heavy Duty—Cast Steel and Semi Steel

Write for Catalog describing . . . .
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WHEN days grow shorter—when dark hours crowd out productive operation—Speed up your Job with a night shift.

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Carbic Light requires no costly installation. Any inexperienced workman can charge it in a few minutes—and it is ready for hours of continuous service.

Carbic Light costs only a few cents an hour.

Extend Your Working Day With
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Without obligation, I would like to have additional information on Carbic Lights.
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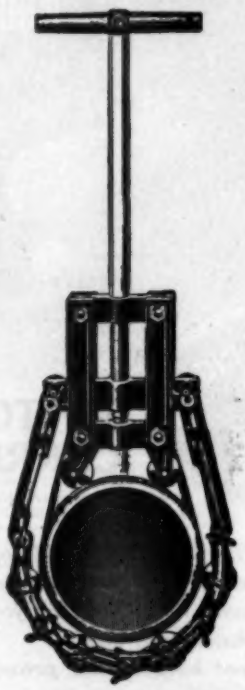

YOU, too, may save the cost of this pipe cutter on one job, just as many other contractors and water companies have done.

The ELLIS PIPE CUTTER

with its six keen rotary cutting blades eats its way right through any pipe in double-quick time. Use No. 01 for all kinds of pipe 4 to 8 inches in diameter, or No. 1 for pipe 4 to 12 inches in diameter.

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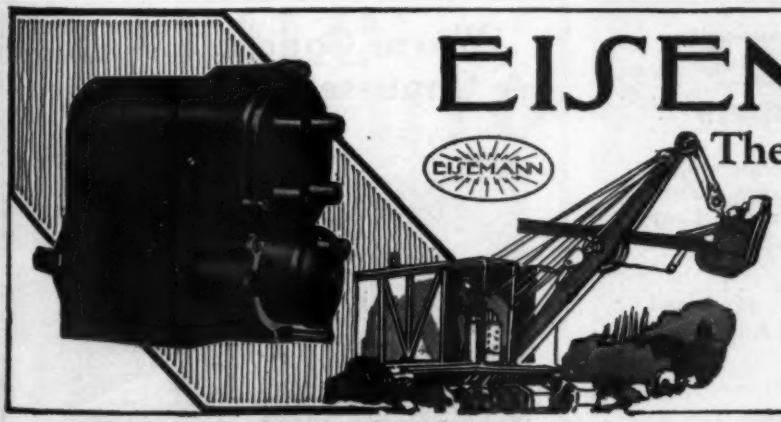

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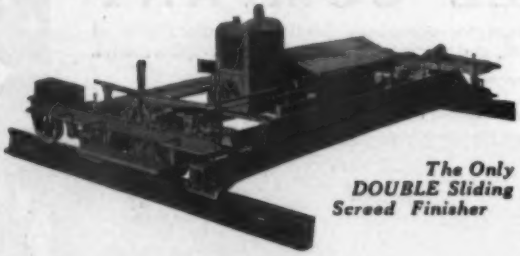

The Only DOUBLE Sliding Screed Finisher

When finishing operations lag, most of the other operations follow suit. Time and labor costs increase and your margin of profit is dangerously lowered.

The *ORD Road Finishing Machine* will keep up with the maximum output of any mixer and produce a quality and uniformity of pavement that gains prompt approval from the highway engineer.

Write today for our new bulletin

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DIVISION OF BLAW-KNOX CO.
Manufacturers of the ORD Concrete Road Finisher
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PORTABLE BELT CONVEYORS

Manufactured in lengths 20 to 60 feet
20 inches or 24 inches wide
Gasoline or electric power
Maximum capacity assured by wide troughed belt without use of side boards to cut belt edges.

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THE FAIRFIELD ENGINEERING CO.
Marion, Ohio

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Self Loading Scrapers

The original self-loading scrapers continue to show their ability to move large quantities of dirt with two to three men. They dig, load, haul, dump and compact the dirt as a single outfit.

They are available in three sizes—¾-, 1- and 1½-cubic yard capacities to suit your job or your tractors.

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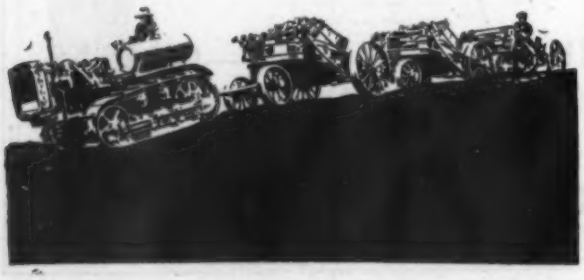
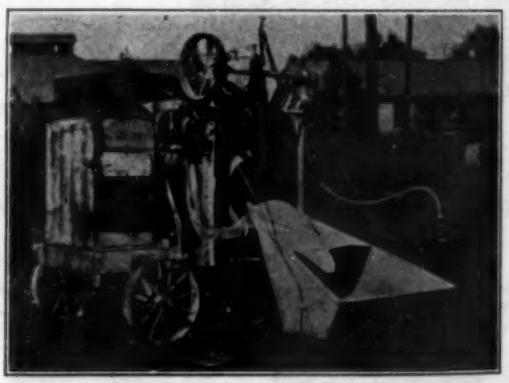
Bulletin No. 286—Baker Rotary Scrapers ☐
Bulletin No. 270—Baker Road Maintainers ☐

THE BAKER MANUFACTURING CO.
585 Stanford Ave. Springfield, Ill.



Warm Concrete With A Chausse Mixer Heater



Chausse concrete mixer heaters deliver a big, clean flame direct into the mixer drum where the contents are well heated during the mixing process. They enable contractors to pour concrete the year round. Made for drum and tilting type mixers and easily applied. Dependable and satisfactory.

Other products—Portable Asphalt Plants, Oil Burning Tar Kettles, Fire Wagons, Surface Heaters and Kerosene Torches.

Chausse Oil Burner Company
Elkhart Indiana

Eliminate the Hazard of Liability

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STEEL BARRICADE SUPPORTS

Painted red—Height 30 in.—For 2 x 6 stringer.
Ruggedly constructed, self-locking, cannot wobble.
Assembled and dismantled easily by one man.
Heavy enough to withstand high-wind pressure.
Placed anywhere on stringer, cleats eliminated.
Initial cost is only cost—repairing eliminated.

When your wood supports need replacement or repairs get CLEVELAND STEEL BARRICADE SUPPORTS. They are PERMANENT EQUIPMENT and a REAL ASSET.

Used by cities of Philadelphia, Pittsburgh, Detroit, and Cleveland, Warren Bros., R. P. Conway Co., J. A. Mercier Co., and hundreds of others.

If your dealer cannot supply you write us direct

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Will your highways be full of tracks in the snow this winter, or will they be kept clean and open to traffic? It's none too soon to think of snow fighting equipment.
Why not get a WARCO grader with snow plow attachment? It will give splendid service winter and summer. Equipment idle half the time earns no profit.

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Graders, Rollers, Wheeled Scoops, Rear Crawlers

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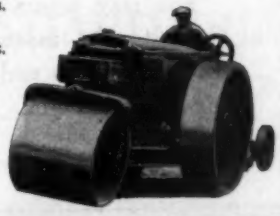
Ability to lead means the possession of those qualities that men recognize as superior. NOTHING ELSE makes leadership.

From coast to coast, wherever new roads are being made or present ones repaired, Buffalo-Springfield Road Rollers are the choice of the men on the job. Advanced design and superior performance make these rollers widely accepted as leaders worthy of the name.

Various steam -and motor-driven designs in all practical sizes. Attachments when desired.

Interesting booklet on request.



THE BUFFALO-SPRINGFIELD ROLLER CO.

Springfield, Ohio

Save $200 over ordinary mixers on Jaeger's One Bag *SPEED KING!*

TILTERS with LOADERS 3½, 5, 7, 10, 14 Ft. Sizes
TRAILERS, . . $169 up!

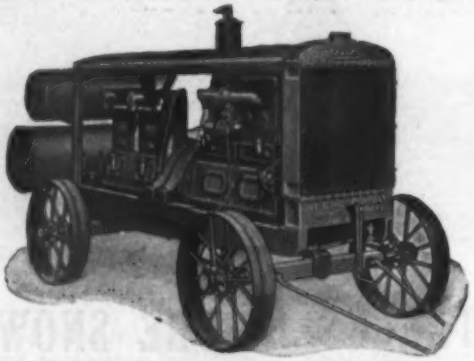
YOU'LL make records with this compact, end discharge, all-purpose mixer. Trails on dual tires and springs; equipped Accurate Measure Water Tank, Skip Shaker, 100% Roller Bearing. Speed to the job—speed on the job.

Get our catalog, prices, terms on non-tilters, 7 to 28 ft. All models.

THE JAEGER MACHINE CO.

701 Dublin Ave. Columbus, Ohio

BUHL BLAZES THE WAY for Lower Air Costs



THE Buhl Portable Compressor embodies the latest up-to-the-minute improvements and consequently is able to produce compressed air more economically than any other compressor is able to do. Furthermore, the many advanced features of the Buhl result in greater *simplicity of operation, longer life* and *freedom from expensive shut-downs.*

Buhl Portable Compressors are obtainable in 36, 55, 90, 100, 110, 220 and 330 cubic feet capacities and with any mounting for portable use desired.

Descriptive bulletins on request

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Protection Planks Crossing Planks
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Address inquiries on Rail Filler, Protection Planks, Crossing Planks, Bridge Flooring, Industrial Flooring to our agents.

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8 N. LaSalle Street
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On steel trucks, standard charging chute, 8-hp. two-cylinder gasoline engine

LANSING 7-S Building Mixer

This mixer has snap and action and is a fast worker. Capacity: 7 cubic feet mixed concrete per batch. EIGHT seconds—and the charging chute is elevated into a large oversize drum. Five mixing blades with six large discharge buckets give quick, thorough mixing and fast discharge. 20-inch drum opening.

Optional Equipment: Power side loader, batch charging hopper, automatic water tank, rotary water pump, loading platform, gravity 8-foot distributing chute, on skids or trucks less power, electric motor, rubber-tired wheels. Write for more complete information and prices.

LANSING COMPANY

Lansing, Michigan

There's a Lansing Dealer in your vicinity

HAVE YOU CHECKED Pages 3 to 30?

The Where to Purchase section in the front part of CONTRACTORS AND ENGINEERS MONTHLY is a very valuable aid to Contractors and Builders who are planning to purchase new equipment.

You may secure catalogs by writing direct to the manufacturers listed, or send a list to us and we will have them forwarded to you.

Stanolind Cut Back Asphalt

DARLINGTON, Wisconsin, paves two miles of streets with Cold Mix Asphaltic Concrete.

The construction work consisted of the necessary grading and building of a three-inch thoroughly compacted macadam base. The cold mix asphaltic concrete wearing course was built to a thickness of three inches. Small trucks delivered stone and Stanolind Cut Back Asphalt to the hydraulic concrete mixer's skip. This concrete was mechanically mixed, spread and rolled.

The paving was economical, durable and smooth riding.

Completed Street

Rolling Surface After Applying Asphaltic Concrete

Mixing Cold Asphaltic Concrete

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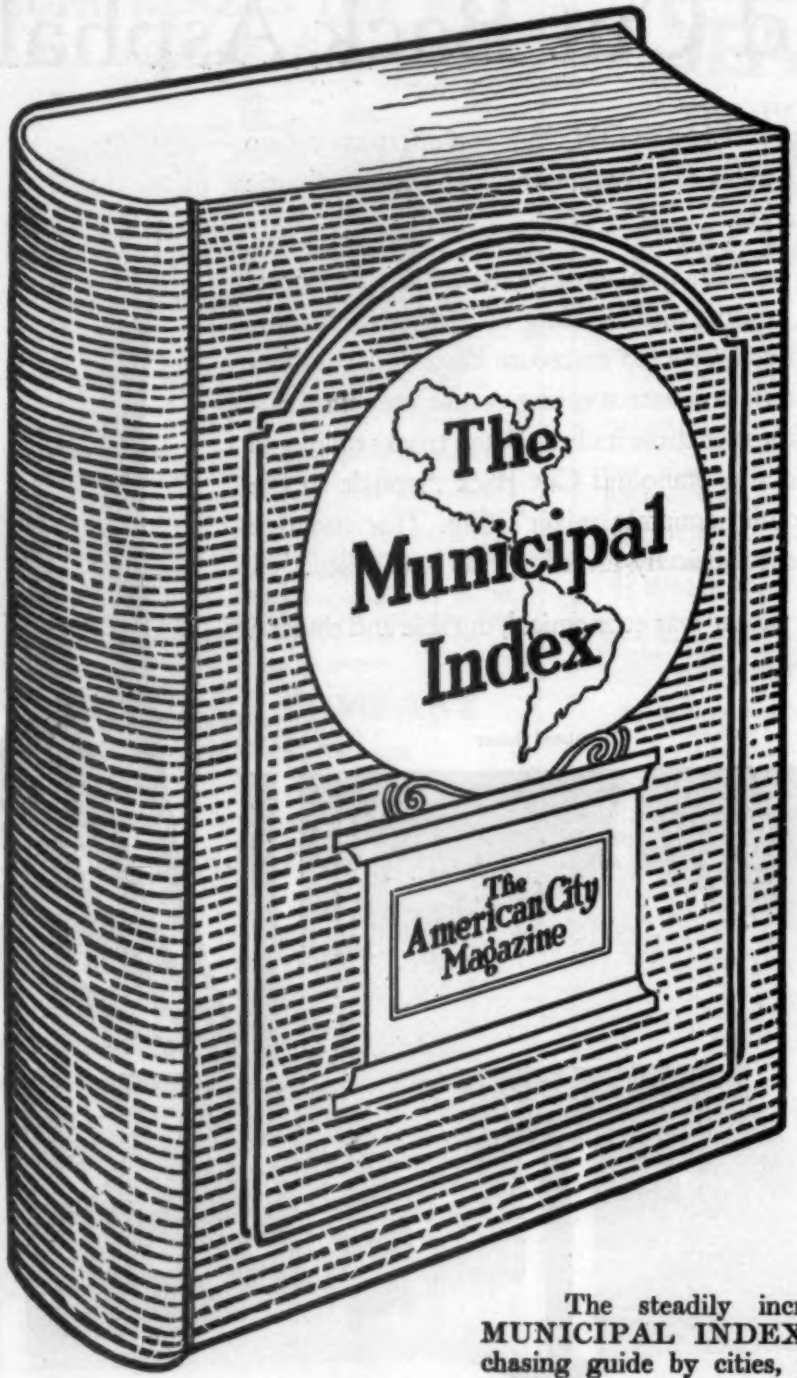

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788 Pages

The steadily increasing use of THE MUNICIPAL INDEX as the standard purchasing guide by cities, towns and counties has resulted in a growing interest in this remarkable volume on the part of public officials, engineers, contractors and manufacturers of equipment and supplies sold in the municipal and county field.

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At 100 degrees... or at zero

—it's as smooth as the top of your desk!

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When it's summer-time in Colorado, concrete surfaces are *hot*—100 degrees or more, and, in winter, sub-zero temperatures are the rule. Yet the concrete road which winds and dips from Colorado Springs to Denver is utterly unmarked by the strains of expansion and contraction. Never a hump, never a hollow . . .

It is protected by the famous Carey Elastite Expansion Joint!

The time-tested, pioneer protection for concrete construction work! It will not melt, it will not become brittle, neither can it disintegrate—the impact of traffic bonds the joint more tightly. Indispensable, yet it adds but a trifle to the aggregate cost of construction. Be sure to have us send you full particulars on Expansion Joint installation.

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The Loomis "CLIPPER" drill is unequalled for drilling blast holes, building and foundation tests, mine air shafts, coal prospecting stripping, mineral tests, oil and water wells. *Write for our illustrated bulletin.*

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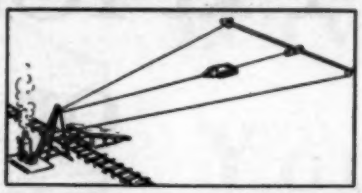

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LOWER Your Costs—WIN More Jobs

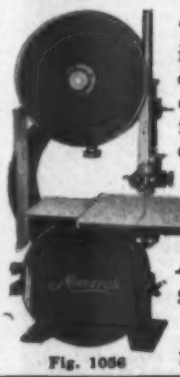

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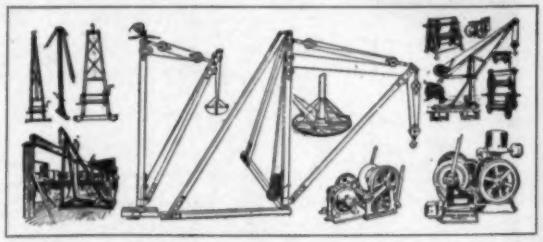
Fig. 1086



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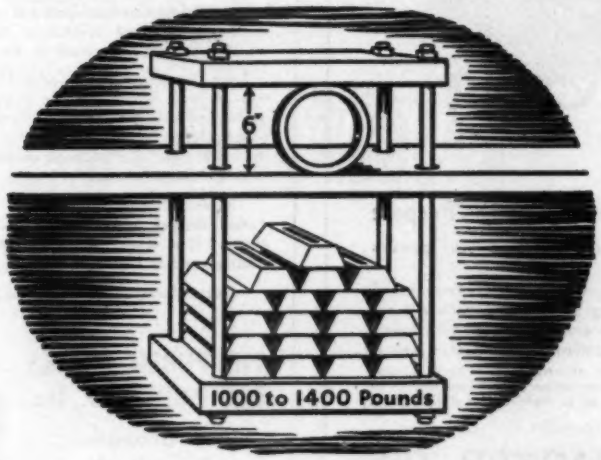
CONTRACTORS AND BUILDERS

If you haven't checked over pages 108 to 114, please do so without further delay, for you will find there a convenient list of items describing the most recent changes and improvements on all types of machinery and equipment used throughout the United States.

A deLavaud pipe section

one inch wide will support *a load of from 1000 to 1400 lbs.*



THE remarkable ability of deLavaud Pipe to withstand severe crushing strains was demonstrated in a ring-crushing test. This test was conducted by a recognized authority, whose report reads in part as follows:

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The facts about deLavaud's great strength are accepted in engineering circles everywhere. It has been definitely proved that deLavaud has 25% greater resistance to internal pressure than good pit cast pipe. The above tests demonstrated deLavaud's ability to withstand tremendous *external* crushing strains.

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Cast iron pipe made by this Company bears the "Q-check" trademark of The Cast Iron Pipe Research Association.

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SAFETY HOOK

The ANDERSON hook is absolutely safe under all conditions and is an essential part of hoisting equipment wherever hooks are required.

This hook cannot accidently become unfastened when attached to load nor will it, at any time, foul or snare projections or obstructions, whether carrying the load or running free.

Note the re-inforcing, flared lips at the bottom of hook which provide a sure and quick method of attaching, thereby forming an interlocking link. A half-turn of the hand releases the attachment and the hook automatically snaps back to closed position.

The ANDERSON Safety Hook is made in varied designs and sizes to meet all requirements. It is being used in many important industries and is highly indorsed by engineers.

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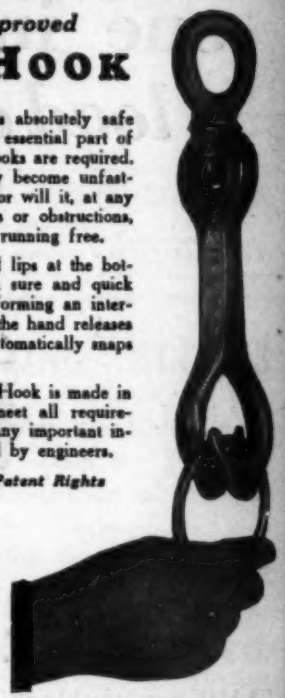

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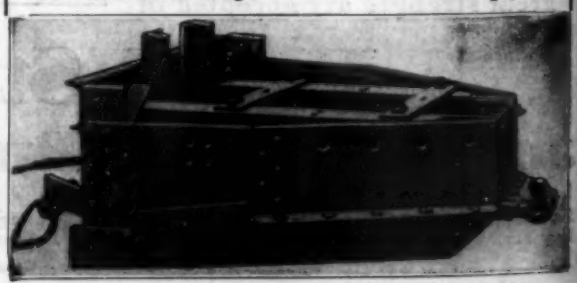
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